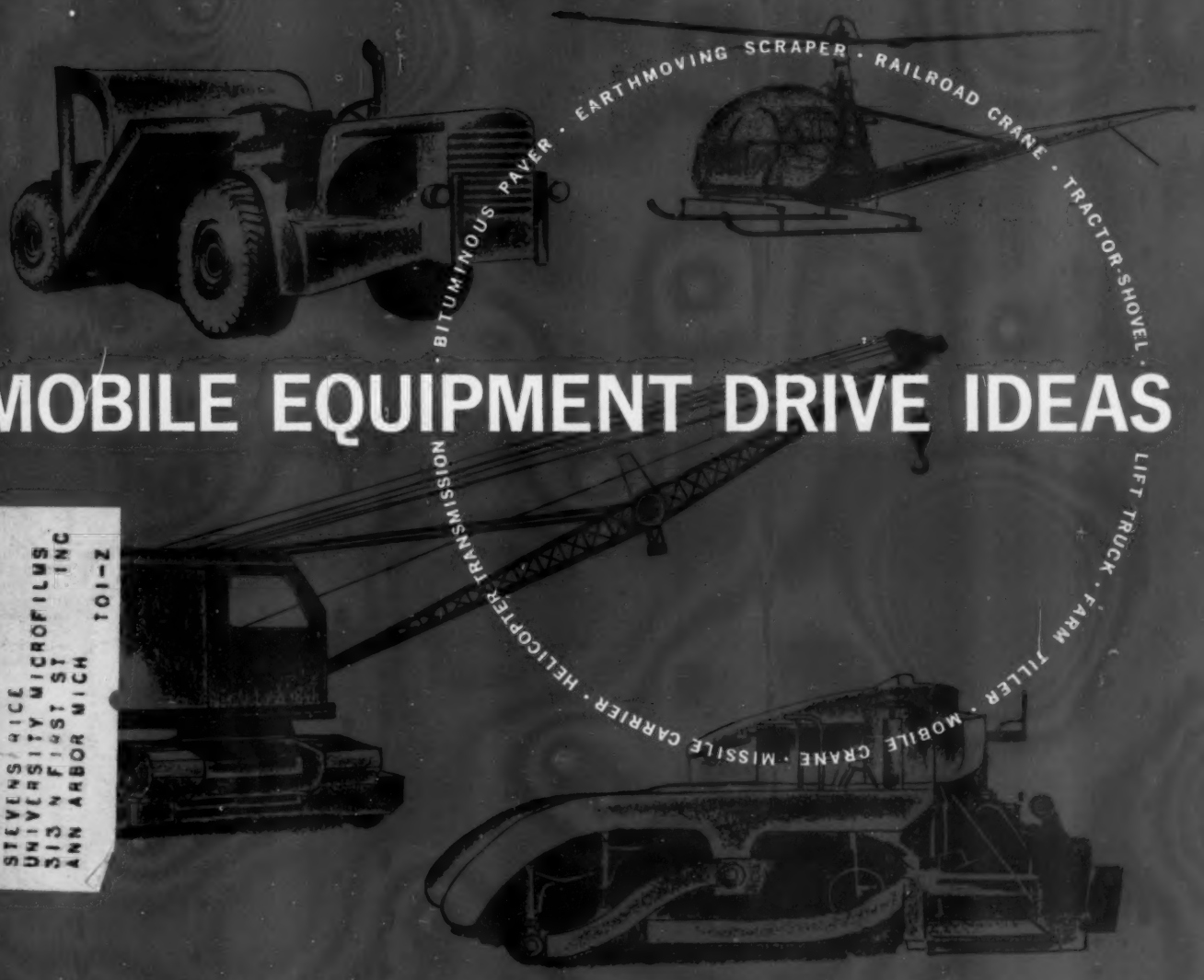
POWER TRANSMISSION DESIGN

APRIL 1960

OEM··MAINTENANCE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MOBILE EQUIPMENT DRIVE IDEAS

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INCLUDING BEARINGS DESIGN/APPLICATION

ALSO IN THIS ISSUE:

Mount Bearings Correctly—Eliminate Failures

Install Drive Components Properly To Increase Engine Life

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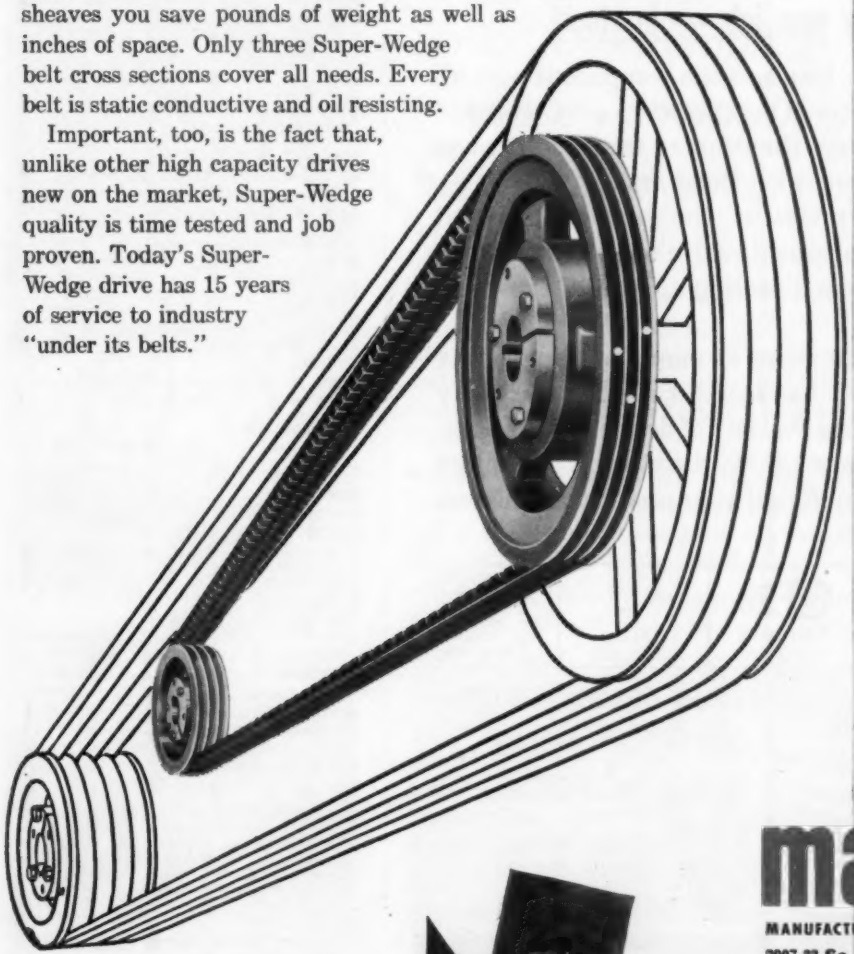
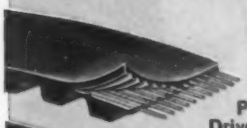


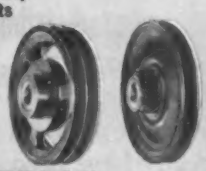
get more **drive**
with Maurey drives



Positive Drive Belts

Variable Speed Belts

Mor-Grip V-Belts



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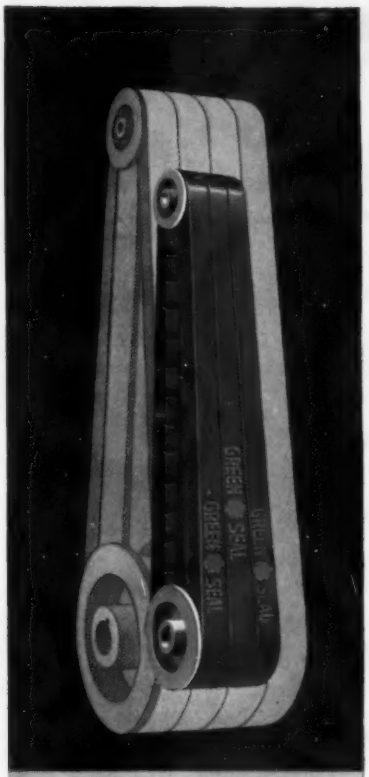

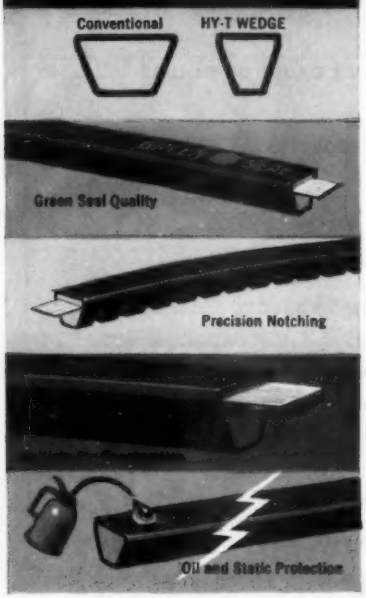

*• **economical**—cuts drive costs up to 20% • **compact**—saves up to 50% in space • **powerful**—fewer belts deliver equal horsepower*

It's just what you'd expect from the Goodyear specialists who pioneered and patented the first wedge-type V-Belt in '48!

Now Goodyear brings you the HY-T WEDGE, a great new V-Belt design that's stripped clean of free-loading "fat." It's a belt that's *all muscle*—capable of handling substantially greater horsepower—on more compact drives—at lower costs.

HY-T WEDGE is the *only* wedge-type V-Belt that can guarantee you Green Seal quality. Famed 3-T Cord construction means that matched sets of these super-strong belts *stay* matched no matter how rugged the drive or how long they're stored.

HY-T WEDGE is precision-notched in smaller-drive sizes to give you maximum flexibility and heat dissipation.

HY-T WEDGE—in larger-drive sizes—gives you multiple-ply construction for super-stamina.

And HY-T WEDGE gives you—without extra cost—built-in protection against oil attack and static electricity build-up.

Here, then, in the HY-T WEDGE, you have a new kind of V-Belt to handle the toughest belting jobs with smaller, more efficient drives—at never-before low cost.

For full details, check with the G.T.M.—Goodyear Technical Man—through your Goodyear Distributor. Or write Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

HY-T WEDGE with the GREEN ✿ SEAL BY

GOODYEAR

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Circle No. 22 on Reader Service Card

APRIL 1960

volume 2 number 4

POWER TRANSMISSION DESIGN

FRANCHISE CIRCULATION

MOBILE EQUIPMENT DRIVE IDEAS

ELECTRIC LIFT TRUCK DRIVE HAS LONG LIFE, SAVES FUEL 17

AUXILIARY HYDRAULIC DRIVE STEERS PAVER 19

SPECIAL COUPLING LETS CRANE DRIVE RAIL CAR 22

FLOATING GEARS UP RATING TO 1000 HOURS 24

OVERRUNNING CLUTCHES MAKE FRONT WHEEL DRIVE AUTOMATIC 26

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Here's Industry's

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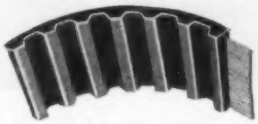
DA 358 V-BELTS

For highly compact, plus-power drives. First major design change in Multiple V-Belts in the last 30 years.



DA POSITIVE DRIVE BELTS

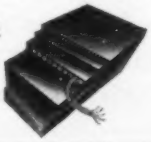
Combines the advantages of the chain and gear with all of the advantages of the belt. No stretch, no metal to metal contact, no constant lubrication.

STURDY-LINK

Pre-stretched link belting available in regular, oil-resistant and static-conductive types.

GENERAL DUTY V-BELTS

Power-balanced construction for flexibility, durability and strength.

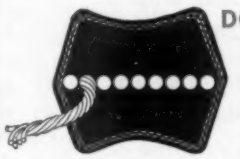


STEEL CABLE V-BELTS

Steel cable permits no-stretch installation. All belts are fluoroscoped to assure extra high quality.

RAILROAD BELTING

High tensile strength, low stretch belting features high fastener tear-out resistance.



DOUBLE V-BELTS

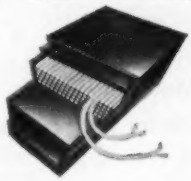
Relieved cross section assures maximum flex resistance. New control methods provide uniform cord section.

OPEN END V-BELTING

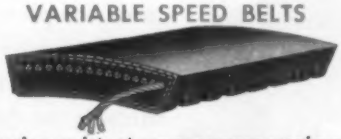
Used on drives where endless V-Belts are not practical. High fastener tear-out resistance.

RED SHIELD MULTIPLE V-BELTS

Red Shield Belts now offer 40 per cent extra capacity. Iso Dynamic matching and cord stability assure precise balance and long belt life. Also available in oil and heat resistant and static dissipating constructions.



VARIABLE SPEED BELTS



Abrasion resistant cover assures maximum life. Crowned cross section maintains stability under extreme loads.

Test . . . Compare . . . You'll Select

DURKEE-ATWOOD V-BELTS

DURKEE-ATWOOD COMPANY • MINNEAPOLIS 13, MINNESOTA

Look for the DA *on your V-Belts*

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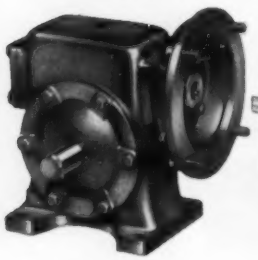
956

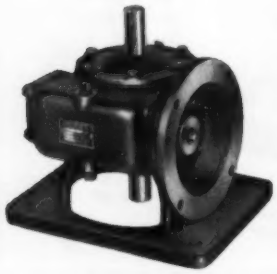
different
motorized
speed reducers

available from stock

Yes! 956 different combinations of Perfection Motorized Worm Gear Speed Reducers are available for immediate delivery, *from stock.* Ratios range from 5 to 1 to 60 to 1, in capacities from 1/6 H.P. to 5 H.P. Perfection "C" Flange Reducers may be ordered complete with motor or without motor, to be used with a motor *of your own choice.*



Flanged motor reducers offer the maximum in compactness, rigidity and adaptability. Through the use of standard NEMA face mounted motors, complete interchangeability between motors is provided. Motor maintenance is possible without disturbing the drive and reducer. Motor assembly is fast and positive with no alignment problems.



Write for your free copy of our new 28 page catalog containing illustrations, charts and tables to help you choose the right Reducer for your particular application. Ask for Bulletin No. M-140.

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PERFECTION GEAR COMPANY, HARVEY, ILLINOIS

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LETTERS

Bearing standardization

Gentlemen:

In the February issue, you illustrate a J & H ball bearing standardization manual on Page 48. Please advise if this manual is available.

JOHN T. WESSEL, Designer
General Engineering Dept.
Anchor Hocking Glass Corp.
Lancaster, Ohio

Although this manual deals specifically with Jack & Heintz products, we've asked J & H to send whatever information they can.

Not really engineer

Gentlemen:

I've been receiving your magazine for the past year and enjoy it a great deal. When I read the January issue, I was shocked at the caption under the picture on Page 21: "Plant Engineer mounts gearmotor on platform adjacent to pumping unit in chemical plant." Having worked in chemical plants for 12 years, I can tell you from experience that if the plant engineer wanted to mount a gearmotor himself, the union would promptly file a grievance.

The term "plant engineer" as used in the chemical industry is reserved for that graduate or licensed engineer who is responsible for engineering, drafting, maintenance, and, above all, capital money spent in a plant, division, or company. The man should have been called an electrician or maintenance mechanic.

R. F. MULLER, JR.
Licensed Mech. Eng., ASME
New Orleans, La.

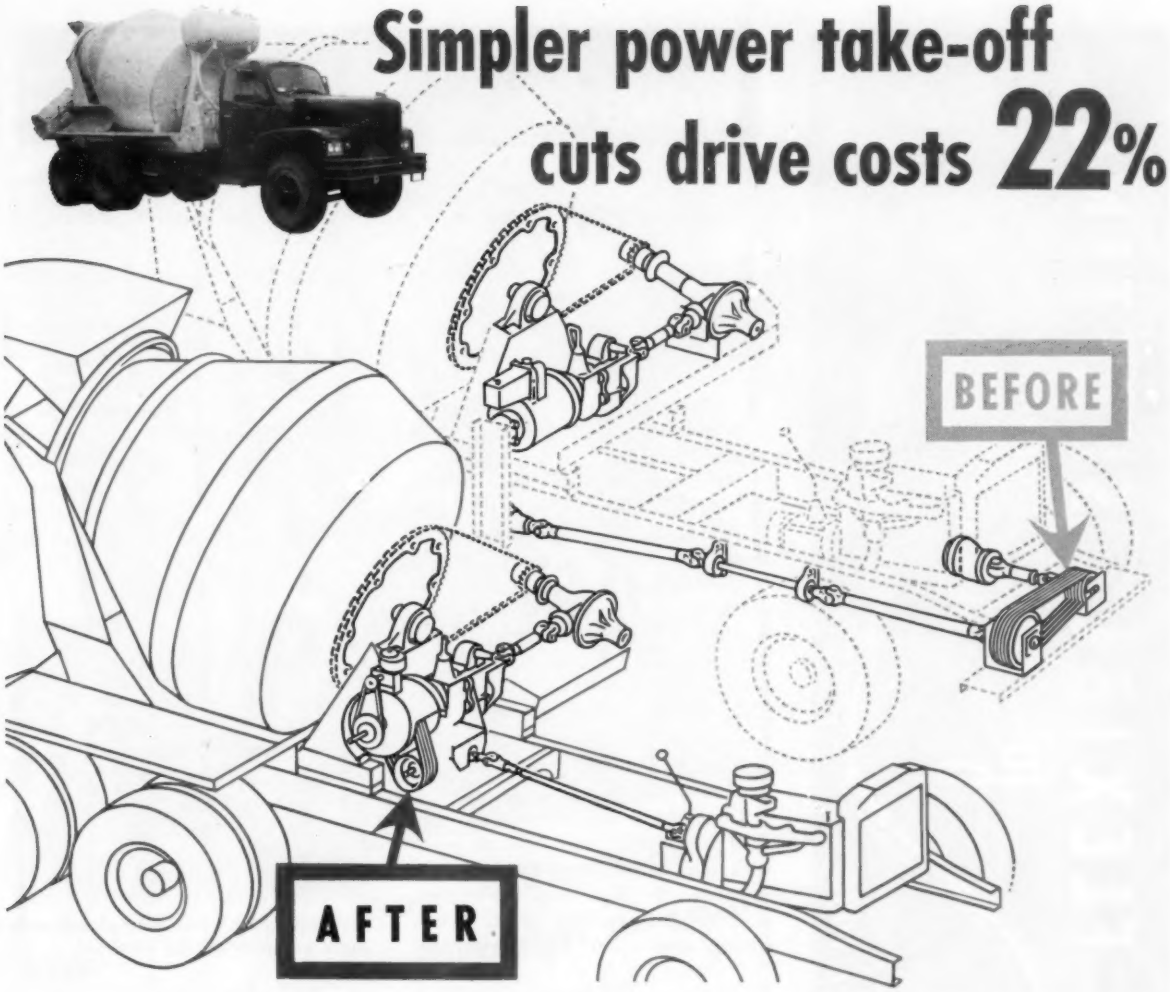
What size?

Gentlemen:

Your magazine helps fill a gap in technical publications. I do have one suggestion that would help the man in the plant, and refers to the fact that many firms supplying transmission equipment fail to mark the size of their products. You'd be doing me a service if you could pass this along to the manufacturers.

D. R. DEWART, Plant Engineer
Celotex Corp., Lagro Plant
Lagro, Ind.

Simpler power take-off cuts drive costs 22%



Super HC V-Belts—packing higher hp capacity in smaller space than conventional V-belts—have eliminated need for front-end power take-off on concrete-mixer trucks made by Concrete Transport Mixer Company of St. Louis, Mo.

By letting take-off be shifted to rear, Super HC V-Belts cut drive costs alone by 22%, besides saving weight and cost of complex linkage and other components of the former front-end drive.

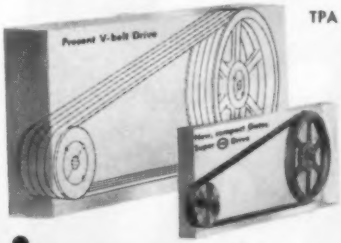
With Super HC, sheave diameters can be cut 30% to 50%, drive space up to 50%, and drive weight 20% and more. A product of Specialized Research in the world's largest V-belt laboratories, Super HC V-Belts are helping many manufacturers put more compact, lighter weight, lower cost drives on all types of machines.

Engineering Service Nation-Wide

What's *your* power transmission design problem? Your Gates Field Representative is ready to help you solve it—to cut space, weight, cost with Super HC V-Belt Drives. Ask him for your free copy of *"The Modern Way to Design Multiple V-Belt Drives"* or write The Gates Rubber Company Sales Division, Inc., Denver, Colorado.

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates *World's Largest Maker of V-Belts*



TPA 485

Gates Super HC V-Belt Drives same hp capacity in smaller "package"

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FLEXIBLE SHAFTING
for power transmission
WRITE FOR CATALOG 250 TODAY!
B.W. Elliott MFG. CO., INC.
251 State St., Binghamton, N. Y.
IN STANDARD SIZES FROM
1/4" TO 1¼" WITH NON-RAVEL CORES
Serving the O. E. M. user since 1932
Elliott

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NEWS *from the power transmission field*

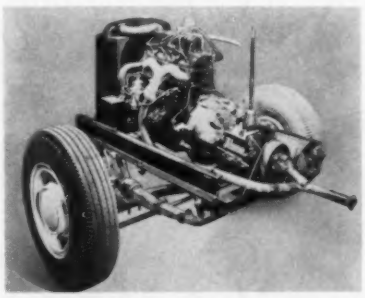
White's PDQ truck has removable power assembly

CLEVELAND, OHIO—The new PDQ (pickup and deliver quickly) multi-stop delivery truck recently introduced by The White Motor Co., has a special front-end power assembly which can be removed and replaced with a spare assembly by one man in less than three hours.

Front axle and wheels, springs, shackle brackets, engine, transmission, and clutch are mounted on a removable power dolly, which fits into the front of the body frame. The power dolly is removed by disconnecting it from the bottom of the unitized body frame, disconnecting a few other components, hoisting the body off the power assembly, and pulling out the dolly. A long pipe clamped to the dolly makes it easier to handle.

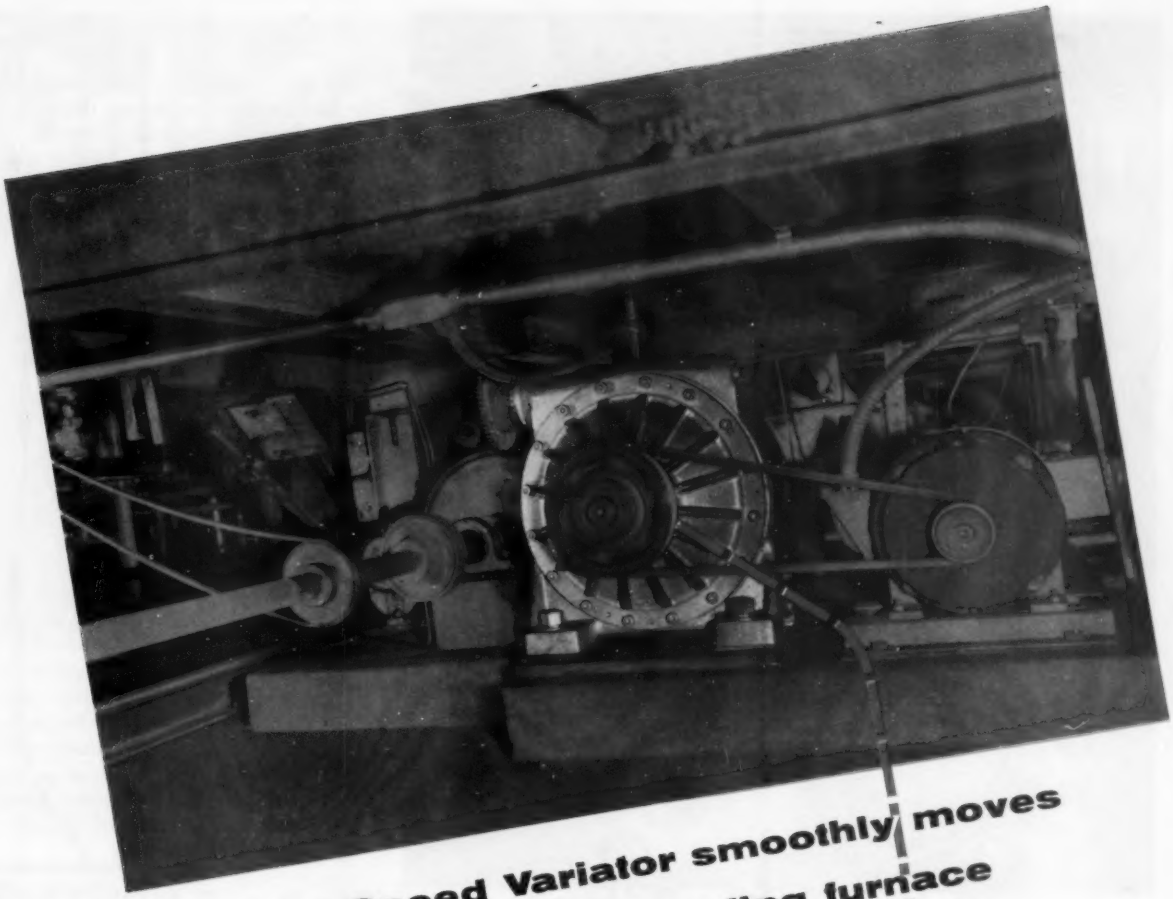
The dolly is aligned in the frame with four studs, and held in place with four bolts. After the bolts are removed, the fuel line, brake line, steering arm, exhaust pipe, clutch, wiring, and other normal linkages are uncoupled. The drive shaft is disconnected from the clutch by removing four bolts. Wiring is unhooked by pulling apart a quick-disconnect plug.

The standard PDQ engine is a special adaptation of the Willys Jeep F-head, 4-cylinder engine developing 70 hp, with a 111-hp, 6-cylinder engine optional. The 10½-in. clutch and Warner T87E transmission are



POWER DOLLY can be replaced with spare assembly during overhaul.

TRUCK IS HOISTED off power assembly, dolly is pulled out.



This Cleveland Speed Variator smoothly moves steel tubes through annealing furnace

A positive, electrically-controlled Cleveland Speed Variator maintains speed of steel tubes passing through this Surface Combustion continuous roller hearth annealing furnace. It drives the furnace's 176 rolls, each 6 feet long by 7 inches in diameter, without any speed fluctuation—that *could* cause uneven annealing, resulting in rejects, lowered production and profits.

Push-button control of the Variator's output speed is easily checked by dial indication showing tube movement.

A dual function is performed by the Variator. It also drives an outlet conveyor, whenever required, through a simple clutch arrangement.

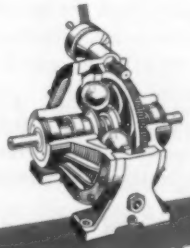
Whenever speed variation is a "must" in your plant, investigate Cleveland Speed Variator. It will pay off in decreased maintenance, improved product quality and output. Send today for your free copy of Bulletin K-200 and get all the facts.

Cleveland Worm & Gear Division
Eaton Manufacturing Company
3273 East 80th Street • Cleveland 4, Ohio

EATON

HOW IT WORKS

Power is transmitted from input shaft to output shaft through alloy steel driving balls which are in pressure contact with discs attached to the two shafts. Relative speeds of the shafts are adjusted by changing the positioning of the axles on which the balls rotate (see cutaway view, right).



CLEVELAND SPEED VARIATOR

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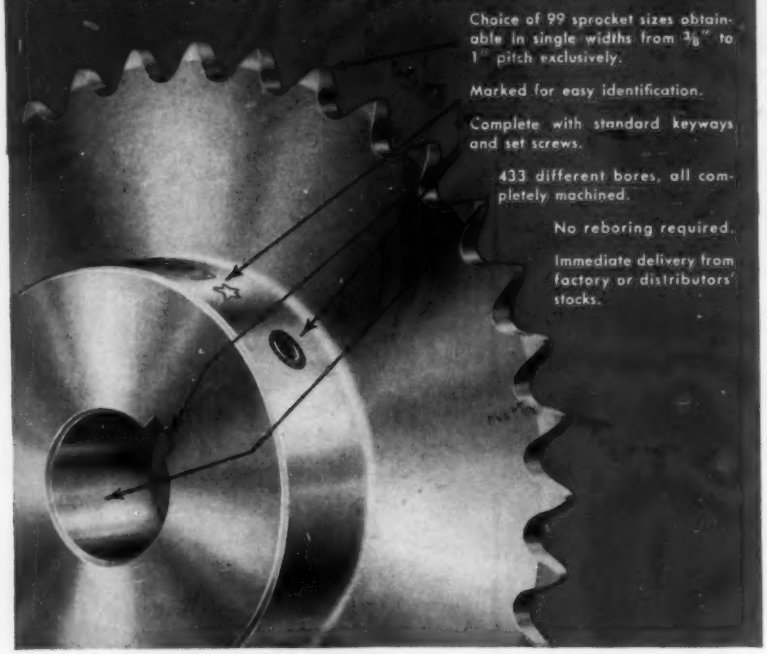
ACME'S
FINISHED BORE SPROCKETS
SAVE TIME AND MONEY


Choice of 99 sprocket sizes obtainable in single widths from 3/8" to 1" pitch exclusively.
Marked for easy identification.
Complete with standard keyways and set screws.
433 different bores, all completely machined.
No reboring required.
Immediate delivery from factory or distributors' stocks.

A terrific saving in time and money . . . reduces downtime . . . reduces maintenance cost

ACME finished sprockets are stocked in single widths from 3/8" to 1" pitch inclusive. 99 Sprocket tooth sizes with more than 433 different bores provide a wide selection range.

All finished bores are completely machined. Bores are accurately finished and are concentric to sprocket pitch and bottom diameters within A.S.A. standards.

ACME also carries a complete line of sprockets such as Grip-Master and Stock Sprockets.

Call your nearest ACME CHAIN Distributor. He has the full cooperation of our Engineering Department.

See us at the Design Engineering Show May 23-24-25-26 Booth 413

Write Dept. 28-K for new 100-page illustrated technical catalog including new engineering section showing 36 methods of chain adjustments.

Acme Chain Corporation
HOLYOKE MASSACHUSETTS

COMPLETE LINE OF ROLLER CHAINS AND SPROCKETS • DOUBLE PITCH CONVEYOR CHAINS • STAINLESS STEEL CHAINS • CABLE CHAINS • FLEXIBLE COUPLINGS • STANDARD AND SPECIAL ATTACHMENTS

Circle No. 1 on Reader Service Card

matched, assembled, and balanced before they're mounted on the dolly.

The trucks are manufactured at the Montpelier Mfg. Co., which was purchased by White Motor last October.

MPTEDA to consider associate membership

WASHINGTON, D. C.—One of the major topics on the agenda of the Mechanical Power Transmission Equipment Distributors Association's spring meeting is associate membership for manufacturers and suppliers of power transmission products. The group meets in New Orleans, April 22-23, at the Jung Hotel.

Officers and directors will decide the issue and, if approved, will be voted upon by the full membership this fall.

Raymond L. Blair, Transmission Equipment Co. of Conn., Inc., has been named chairman of the Industry Relations Committee, which will study products, services, and problems of suppliers and buyers to keep the association abreast of developments in the industry.

Bendix changes name

SOUTH BEND, IND.—Bendix Aviation Corp. stockholders voted to adopt the name of The Bendix Corp. The change will go into effect about June 1 to permit adequate preparation for the change.

Primary reason for the change was to avoid the impression that the firm's products and skills were limited to the field of aviation.

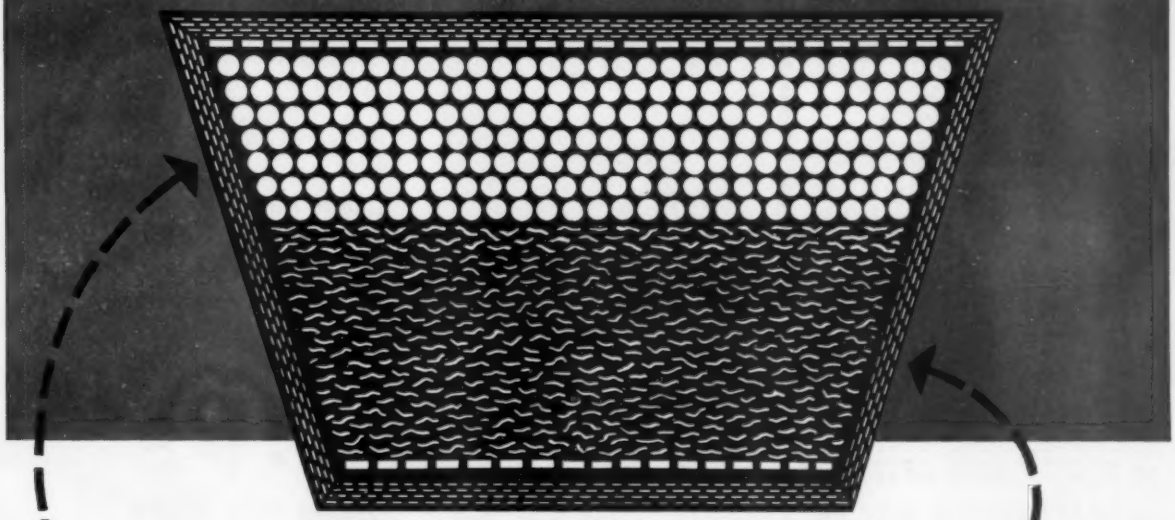
Multifuel diesel engine

WASHINGTON, D. C.—An Army Transportation Corps report on a versatile, multifueled diesel truck engine has been published by the Office of Technical Services, Business and Defense Services Administration, U. S. Dept. of Commerce.

The Army reports superior performance of this engine, which burns anything from gasoline to kerosene or marine diesel fuel. The report, PB 161114, *Multifuel-Diesel-Engine Truck*, may be ordered from OTS for $1.

continued on page 62

Only BOSTRON V-Belts



are made with...

BOSTRON Tensile Members PLUS NEOPRENE with FIBER-DISPERSED Stock

GREATER STABILITY — Changes in humidity — and the resulting moisture regain — often mean a matching problem with ordinary V-Belts. The moisture regain of BOSTRON is low — 0.4% — or 1/20th that of the conventional reinforcing fiber. This means far less time spent in matching, and lower belt inventory too.

HIGHER STRENGTH — Stronger belts can withstand more shock loading, need less maintenance. BOSTRON is approximately 40% stronger than the conventional fiber used in V-Belts.

STRETCH RESISTANCE — V-Belts reinforced with BOSTRON have low stretch. BOSTRON is inherently stretch-resistant and the cords are put through a special heat and tensioning process to further minimize stretch. Thus, belts reinforced with BOSTRON show comparatively little growth — even after many months of continued operation.

GREATER RESISTANCE to oils, heat, abrasion, chemicals and ozone is provided by Neoprene.

HIGH CROSS-WISE RIGIDITY is provided by the closely-packed, straight-line formation of the fibers in the compression member.

EXCEPTIONAL LENGTH-WISE FLEXIBILITY is provided by the virtually frictionless positioning of fibers.

EXTRA SUPPORT for the tensile members during shock-load impact and during normal operation.

The industry's most advanced developments are now standard in the entire BOSTON Multiple V-Belt line!

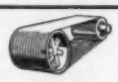
● CUT DOWN MAINTENANCE ● MAINTAIN SMALLER INVENTORY ● SAVE MATCHING TIME ● SAVE TAKE-UP TIME

BOSTON

BOSTON WOVEN HOSE & RUBBER COMPANY
DIV. OF AMERICAN BILTRITE RUBBER CO., INC.
BOSTON 3, MASS.

INDUSTRIAL HOSE

BELTING


V-BELTS

PACKING

MATTING

TAPE

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SIMONDS
INDUSTRIAL
CUT GEARS

★ FINISHED GEARS
★ CUSTOM GEAR CUTTING
★ HEAT-TREATED, CASE OR FLAME-HARDENED

You are sure of quality and prompt service when you place your industrial cut gear requirements with SIMONDS GEAR. We produce the full range of sizes in the types and materials you need from your blanks or ours. Let us quote on your next gear requirements.

* * *

Stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

THE SIMONDS GEAR & MFG. CO.
LIBERTY at 25TH PITTSBURGH 22, PA.

Quality Gears for over 65 years
Circle No. 31 on Reader Service Card

MEN of the power transmission field

Harry Pelphrey dies

DETROIT, MICH.—Harry Pelphrey, director of research of Michigan Tool Co., died recently. Regarded as one

PELPHREY

of the leading research engineers on gears and gear manufacturing, he'd been with Michigan Tool since 1929. Among other things, he created a line of machines and tools to produce a new form of gearing, developed processes and machines for producing toothed parts without machining, and invented a gear-cutting machine which reduced cutting time as much as 90%.

Boston Woven Hose promotes O'Leary

BOSTON, MASS.—Thomas O'Leary, former V-belt sales promotion specialist, has been appointed V-belt product manager for the Boston Woven Hose & Rubber Div. of America Biltrite Rubber Co. He succeeds Stanley C. Swanson, who has taken a position in another industry.

Changes at Kaydon

MUSKEGON, MICH.—Two new executive vice presidents—J. Frank Oehlhoffen and Frank X. Bujold—have been appointed at The Kaydon Engineering Corp. Oehlhoffen, former vice president and sales manager, will head Kaydon's manufacturing, purchasing, and engineering and will continue in charge of Frauenthal Div.

David C. Maxwell, former assistant sales manager, automotive bearings, is now general sales manager. Robert L. Blais, former Eastern assistant sales manager, becomes sales administration manager, a new post. Robert A. Weisse, former Western assistant sales manager, is now assistant general sales manager.

Lima names Dorsey

LIMA, OHIO—John W. Dorsey has been named manager of The Lima Electric Motor Co.'s Cincinnati area sales office. He'll handle sales of integral horsepower motors, speed changers, speed reducers, and other electrical power drives out of a new office at 109 Ridgemont Ave., Covington, Ky.

Haley joins board of Durkee-Atwood

MINNEAPOLIS, MINN.—Carter B. Haley has been elected to the board of directors of the Durkee-Atwood Co. He also becomes vice president of the Industrial Div. Formerly vice

HALEY

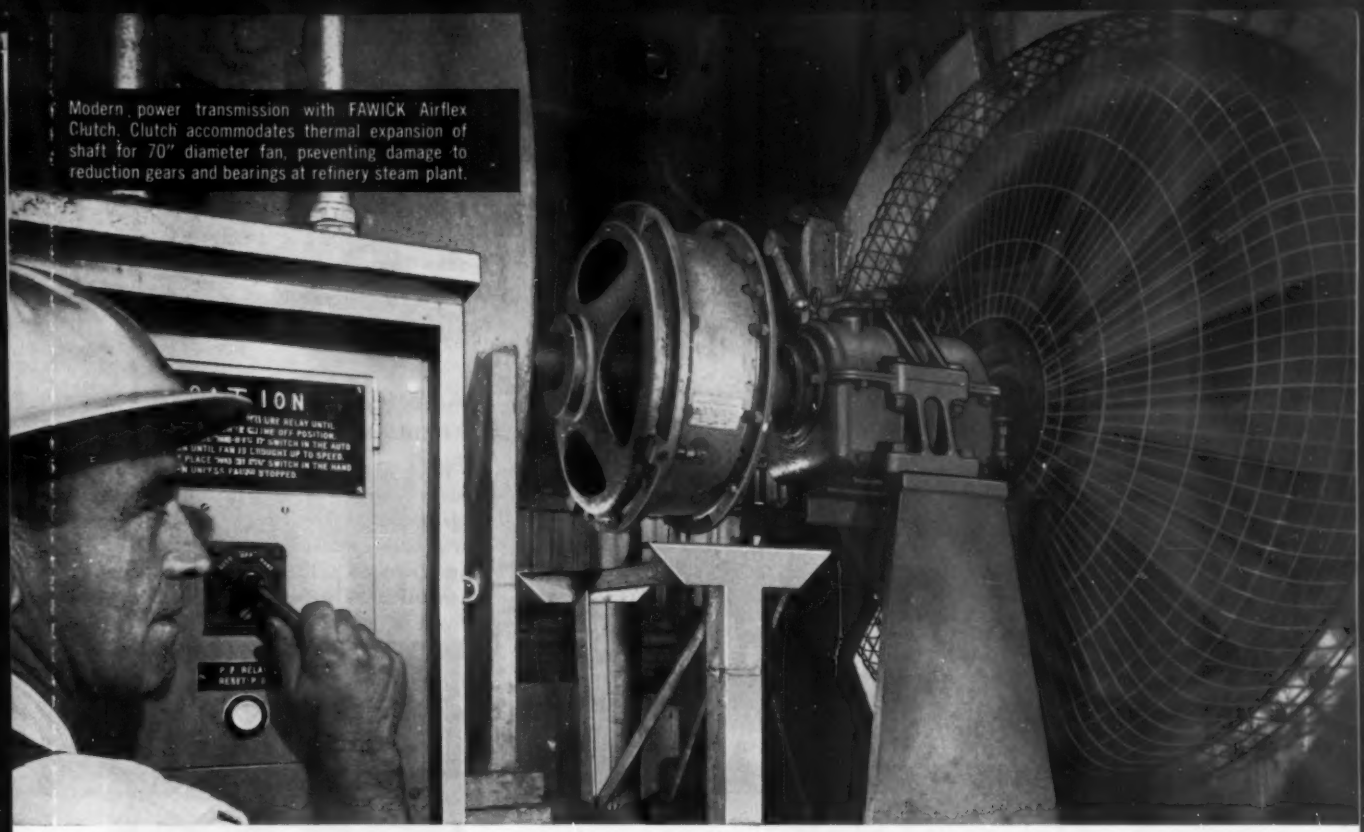
OLSON

president, Industrial Div. sales, Haley has been with Durkee-Atwood for 10 years.

At the same time, E. I. Olson was appointed sales manager, Industrial Div. Olson joined the firm in 1946 and had been chief field engineer for the Industrial Div.

Shifts in sales at Western Gear

BELMONT, CALIF.—Howard J. Feichtmann has been promoted from sales engineer to sales manager of the Los Angeles district for the Industrial Products Div., Western Gear Corp. He succeeds Robert McNamara, who



Modern power transmission with FAWICK Airflex Clutch. Clutch accommodates thermal expansion of shaft for 70" diameter fan, preventing damage to reduction gears and bearings at refinery steam plant.

Fawick Airflex Clutches compensate for shaft expansion!

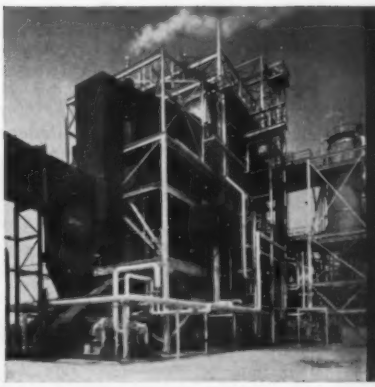
Ability to compensate for changing shaft dimensions is a performance bonus of FAWICK Airflex Clutches that can help you solve special power transmission problems.

This has been proved in a steam plant application at Tidewater Oil Company's Avon (Calif.) Refinery. Here, forced and induced draft fans used in conjunction with the plant's furnace are driven through Airflex Clutches which provide an additional function of accommodating thermal expansion of the fan shafts.

Shaft elongation of ⅜" to ½" occurs after either fan has been started and the shaft comes up to normal operating temperature. All of this motion is absorbed within the FAWICK VC Ventorque Clutch which couples each shaft end to its power source. An automatic timing device momentarily disengages the clutch at regular intervals during shaft warmup, allowing the shaft-mounted drum to move further into the clutch element assembly. The friction shoes then regrip the drum in a new position. Fan speed and efficiency are not affected.

The FAWICK VC Ventorque Clutches are especially designed for the rugged duty encountered in this and other heavy equipment applications. They permit gradual fan start-up through slip-clutch action. Rapid heat dissipation through ventilated construction prevents loss of clutch efficiency. The clutches have required no maintenance since installation.

This is just one example of the many special ways in which FAWICK Airflex Clutches provide high-efficiency power transmission throughout industry. Call in your nearest FAWICK representative or contact the Home Office for expert consultation on your application.



Fans for Tidewater's boiler and stack system are dual driven, with main and auxiliary prime movers on opposite sides of each fan. Airflex Clutches on each fan shaft permit quick shifting from main to auxiliary drive without shutdown or time loss.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
Fawick Canada, Ltd., 60 Front St., West, Toronto, Ont., Canada

FAWICK AIRFLEX
INDUSTRIAL CLUTCHES AND BRAKES

Circle No. 20 on Reader Service Card

Janette

N.E.M.A.

"C" FACED SPEED REDUCER...

Gives you new concepts in practicability, flexibility and availability

PRACTICABILITY:

The "C" Faced Speed Reducer features an independent, hollow shaft, gear reduction unit used with a standard separate N.E.M.A. "C" Face Mounting Motor.

Here's real practicability—the original motor can be replaced regardless of reason; whether motor failure or to replace with a motor having different specifications in voltage, torque, etc., *without disturbing gear unit or removing unit from the installation.*

FLEXIBILITY:

Janette N.E.M.A. "C" Faced Reducers may be supplied with a Janette motor or without a motor.

This means you always have the motor of your choice.

Motor H. P. rating from ⅛ to 5 H. P. and Gear Ratios from 4 to 1 up to 90 to 1 in standard models. A.G.M.A. Class II and Class III gears also available.

AVAILABILITY:

"C" Reducers are supplied from a nationwide distributor and service organization—105 distributors, 87 service stations, and Janette's 32 warehouses. This nationwide distribution means prompt efficient service to all gear-motor users regardless of where they are located.

Janette N.E.M.A. "C" Faced Speed Reducers are guaranteed by the Janette Electric Mfg. Co., designers and manufacturers of Speed Reducers and Gear-Motors for 50 Years.

Get the complete story. Call your Janette Distributor, Salesman, or write for Bulletin No. 5-250.

SINCE 1910 Janette GEAR MOTORS MOTORS SPEED REDUCERS

Janette Electric Mfg. Co., Morton Grove, Ill.

Circle No. 23 on Reader Service Card

MEN *continued*

was made assistant division manager of the Graphic Arts Div.

Charles C. Harshberger, former Portland district sales manager, goes to Seattle district headquarters as sales manager. Fred Hearing, formerly sales engineer in Seattle, takes over as Portland district sales manager.

American Pulley names Bass, Bain

PHILADELPHIA, PA.—At The American Pulley Co., Walter C. Bass was elected executive vice president and will be responsible for all marketing functions as well as overall company operations. Charles E. Bain was elected vice president and general works manager and will be responsible for product development, research, engineering, and manufacturing. Bass formerly was general sales manager; Bain had been general works manager.

BASS

BAIN

Keyes has new post at Dayton Rubber

DAYTON, OHIO—L. J. Keyes has been been named vice president and director of purchases for The Dayton Rubber Co. This is a new post on the corporate staff level, and Keyes will coordinate the puchasing of the company's divisions. Keyes joined the firm in 1945.

Jester promoted at GE

SCHENECTADY, N. Y.—L. T. Jester, Jr., has been named manager of the Process Machinery Industries Sales Unit in General Electric Co.'s Component and Intermediate Distribution Sales Dept. The department is part of the Apparatus Sales Div. With General Electric since 1941, Jester formerly was a senior application engineer in the Industrial Machinery Unit.

Melisz joins Winsmith

SPRINGVILLE, N. Y.—John M. Melisz has been appointed chief engineer

MELISZ

at Winsmith, Inc. He formerly was assistant chief engineer at the Farnham Div., Wiesner-Rapp Co.

Minder elects president

LOS ANGELES, CALIF.—S. V. Wagner has been elected president of the J. W. Minder Chain & Gear Co. Formerly vice president and manager of Minder's Portland branch, Wagner succeeds E. A. Minder, who resigned.

Wood joins Cottingham

DALLAS, TEXAS—W. H. Wood, who has purchased a stock interest in Cottingham Bearings & Service, takes over as general manager of the firm. He'd been with Dayton Rubber Co. for 10 years as sales representative and regional manager.

Richards heads Tormag

MILWAUKEE, WIS.—C. L. Richards has been named manager of the Tormag Products Div., Gleason Reel Corp. Gleason Reel recently bought the manufacturing and sales rights of Tormag Magnetic Drive from Whitney Chain Co. Richards formerly was chief engineer at Whitney Chain Co.

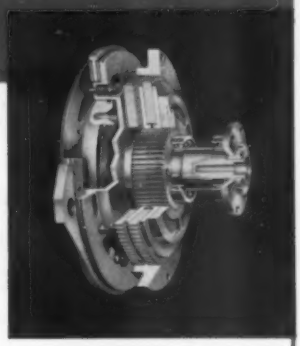
Prudential Industries names secretary-treasurer

PHILADELPHIA, PA.—Ann Troup, treasurer of Atlas Chain & Mfg. Co. since 1949, has been elected secretary-treasurer of Prudential Industries, Inc., holding company of Atlas Chain, Atlas Precision Products Co., and Measurements Research Co.

FOR OEM

- Controlled single or multiple cycling within a wide range of speed.
- Clutch and brake in a single synchronized unit.
- Adaptable to mounting on crank, cam or drive shaft for flywheel or geared applications.
- Can be used with flywheel, gear or drive-spider and mounted outboard or between bearings.
- Constant or variable clutch torque.
- Compact, space saving, easily installed.
- Minster Electrical Controls to your requirements.

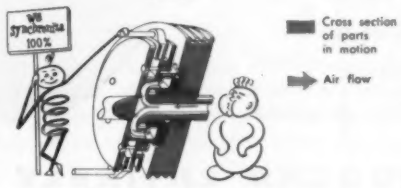
Write for OEM Clutch Bulletin CFC 54.



Combination Clutch and Brake

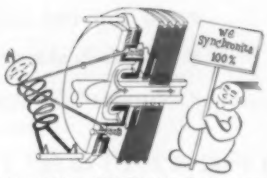
Air-Operated • Compact
Fast Acting • Perfectly Synchronized

RUN



AIR IN—CLUTCH ENGAGED—(brake off)

STOP



AIR OUT—BRAKE APPLIED—(clutch disengaged)

FOR PRESS CONVERSION

A Minster clutch conversion is the most profitable way to increase press efficiency. It eliminates downtime . . . reduces maintenance and parts replacement . . . increases die life . . . reduces operator fatigue . . . improves safety and increases production.

Minster conversion units, made by a press manufacturer who knows your problems, are standard clutches individually applied to your press. Complete with flywheel and shaft, ready to drop in place. Thousands in daily use.

Write for Clutch Conversion Booklet CC57.

THE MINSTER MACHINE COMPANY · MINSTER, OHIO

MINSTER®

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Maxitorq 9000 SERIES*

ELECTRIC CLUTCHES or BRAKES

Featuring these

Advantages:

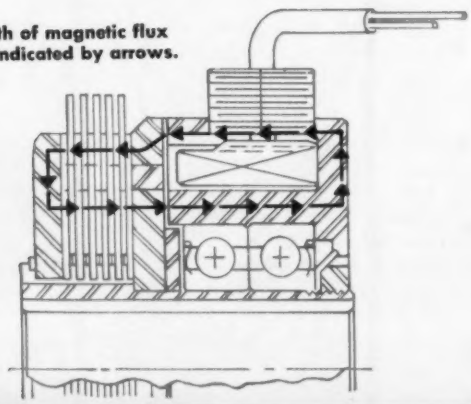
- **Compact and Simple Design**
- **Built to American Standards**
- **Stationary Coil**
- **No Slip Rings or Brushes**
- **Self-Adjusting—Easily Installed**
- **Drag-free Floating Neutral**
- **No Stressed Levers or Parts**
- **Use as Brake or Clutch**
- **Standard Flange Cups Available**

**Patent applied for.*

OPERATION INDUCED ENTIRELY BY *Magnetic Flux*

The new Maxitorq #9000 Series Electric Clutch is a compact, self-contained unit with operation dependent upon induced magnetic flux. As shown in the drawing below, this new Maxitorq Clutch consists essentially of a sealed magnetic coil and housing arrangement actuating multiple discs which also act as the flux path. Because the coil housing, supported on anti-friction bearings, is stationary, troublesome brush and slip ring construction is eliminated. When energized, the entire assembly consisting of pressure plate, inner and outer discs, and buttress plate is locked together by the magnetic force passing through it. When de-energized, Maxitorq separator springs instantly separate the discs creating air gaps which help to break up residual magnetism. Compactness, fast response, and flexibility of control make the #9000 Series clutch or brake ideally suited for a wide range of applications.

Path of magnetic flux is indicated by arrows.



Write, phone, or wire Dept. PT now for Bulletin 90 describing the most advanced design of electric clutches or brakes available today.

THE CARLYLE JOHNSON MACHINE CO. • MANCHESTER, CONN.

Circle No. 10 on Reader Service Card

Mobile Equipment Drive Ideas

Articles in this issue are all concerned with solutions to power transmission problems on mobile equipment. We've tried to offer real variety. Equipment covered varies from a helicopter to a railroad crane.

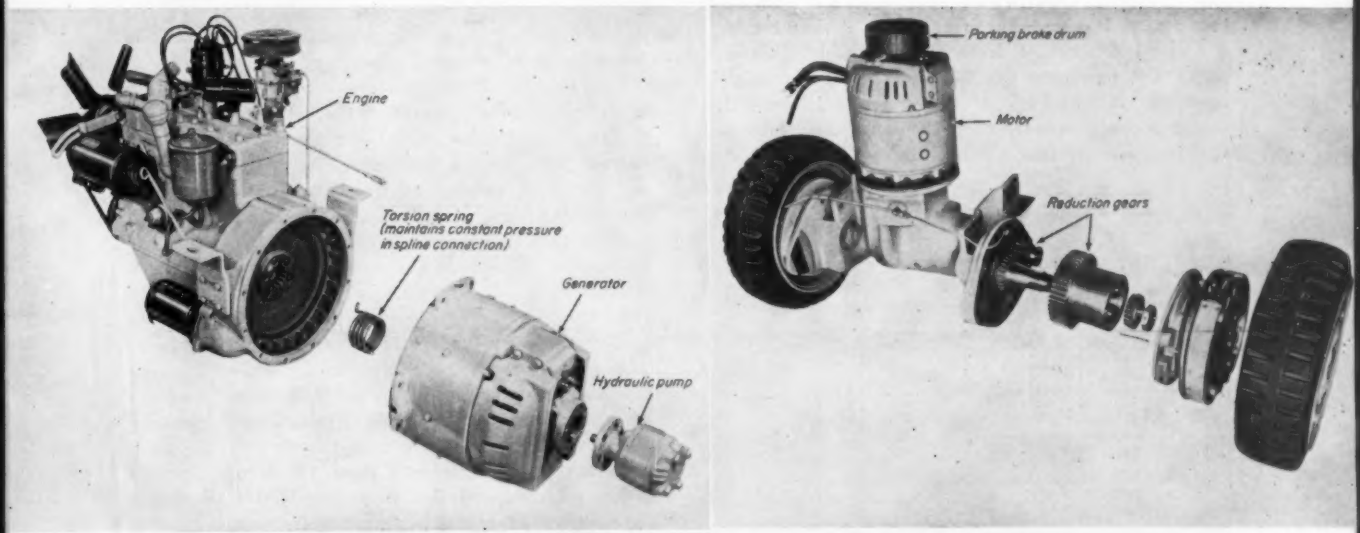
Designers of mobile equipment are faced with certain problems that may at first glance seem to be peculiar to machines that are on the go. But, the lesson learned while designing a large off-highway truck or a farm tilling machine could be just the thing needed to make that next widget-making machine to come off the drawing board a little bit better than the one the competition comes up with. Or, one of these ideas might be all you need to perk up that balky machine that's always holding up production.

Just in case there should be any doubt on this point, there's also a good chance that some of these ideas might be useful to mobile equipment designers.

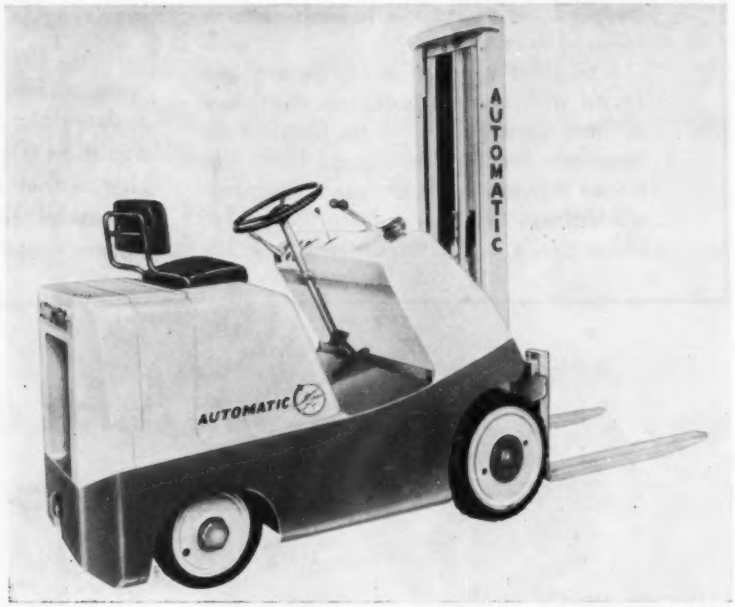
Electric lift truck drive has long life, saves fuel

ELECTRIC DRIVE TRAIN on a lift truck greatly simplifies transmission of power from the engine to the driving wheels. Additionally, it allows the engine to work at its most efficient rpm regardless of vehicle speed. This results in gasoline savings up to 30% over more conventional drives. Life between overhauls of transmission components (generator and motor) may easily be five times longer than that of components used in other drive systems.

The variable-voltage dc generator bolts directly to



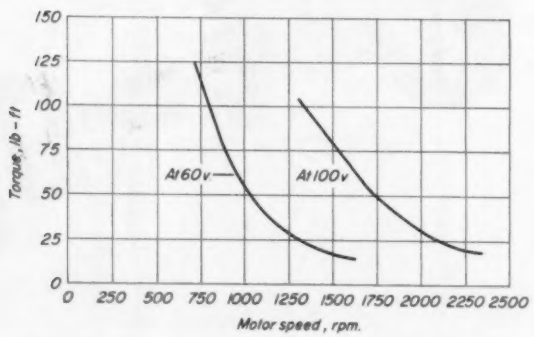
ELECTRIC LIFT TRUCK DRIVE is simple. Generator is driven directly by the engine. Hydraulic pump is driven from the rear of the generator. Motor mounts on the drive axle. Only connections between power unit and axle drive are wires.



FUEL ECONOMY, LONG LIFE result from using electrical drive on series of fork-lift trucks.

LIFT TRUCK DRIVE *continued*

the engine flywheel housing and is driven through a splined connection from the flywheel. Hydraulic pump for powering the lift and tilt movements is mounted on the back of the generator. The drive motor mounts directly atop the drive axle housing. It drives directly into a conventional differential. Additional spur gearing is used for torque multiplication in the wheel hubs. Motor shaft extends above the motor to permit mounting a parking brake which is independent of service brakes.



SPEED-TORQUE characteristics for the electrical drive. High torque at low speed is excellent match for actual vehicle torque requirement.

The electric drive provides torque multiplication of 8:1. Two of the features which contribute to the performance of this drive are: electrical disconnection of the generator load when the engine is idling; and electrical inching control. The first of these is gotten by using an accelerator operated switch to connect and disconnect the generator. Thus there is no load on the engine and no possibility of the truck creeping when the accelerator is released. Generator field weakening, controlled by the operator through a foot-operated switch, permits very precise inching. This reduces generator output for a given engine rpm and also makes it possible to get high output from the hydraulic pump for fast tilting, raising, and lowering at low vehicle speeds.

In any vehicle, highest torque requirement occurs at low vehicle speed. Accompanying curves show how the electrical drive matches this requirement.

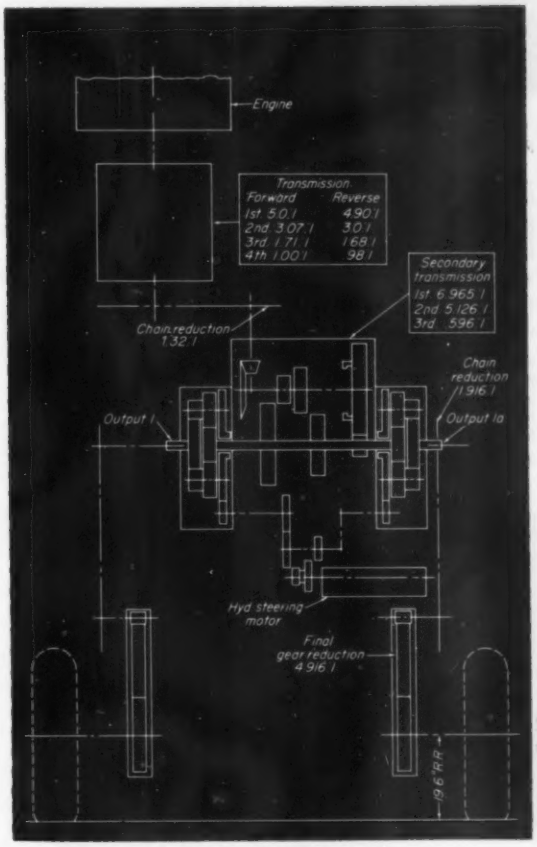
This drive is used on 3,000 to 10,000 lb capacity lift trucks made by *Automatic Transportation Co.*, Chicago, Ill. ▲▲▲

Auxiliary hydraulic drive steers paver

By GUY BANNISTER
chief technical engineer
Barber-Greene Co.

SKID STEERING, some way in which the tracks or wheels on one side of a vehicle are made to travel at a higher speed than those on the opposite side, is used on crawler tractors and certain pneumatic-tired vehicles where the wheels on one side are rigidly connected together by the drive system. Best-known systems are those using clutches and brakes or differentials and brakes to slow or stop one side of the vehicle. Other systems have been developed recently using variable-ratio drives to each side, individual electric drives, and even two complete drive trains, one for each side, have been used.

One newly-developed system for use on a bituminous paver at the relatively high speed of 12 mph elimi-



PAVER DRIVE TRAIN.

CONTINUOUS PAVER has unusual power steering system using auxiliary hydraulic drive.

AUXILIARY DRIVE *continued*

nates steering clutches and brakes, supplies power to both sides of the vehicle at all times with no free differential action, requires almost no operator effort, and is quite simple. This system uses an auxiliary hydraulic motor to change the effective reduction ratios of the planetary final drive gearing.

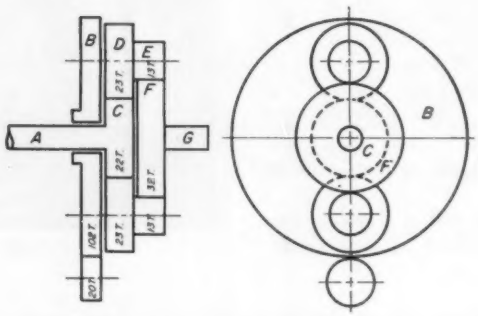
The final drive consists of two identical spur-gear planetary reduction sets, driven by an input bevel gear set through one or the other of two pairs of spur reduction gears. The spur reduction gears are used to select either low speed range for paving or high speed range for travel. A four-speed forward and reverse transmission is used ahead of the final drive.

The auxiliary steering drive, built into the final drive case, is a rotary hydraulic motor which drives through gears to both planetary reduction sets. Gearing ratio between the hydraulic motor and the planetary sets is the same, but for a given direction of rotation of the hydraulic motor, the planetary sets are driven in opposite directions.

When the hydraulic motor is not driving, it locks the planetary sets, they each provide 2.57:1 reduction and the paver travels straight ahead. When the hydraulic motor starts, it drives both planetary sets, one forward and one in reverse, to increase speed on one side of the paver and decrease speed of the other side by an equal amount. A sliding cluster gear in the steering drive train is used to change speeds of the auxiliary drive when the main drive is shifted to select the travel or working speed range.

Both direction and speed of the hydraulic motor are controlled by valves actuated by a shaft and steer-

How to compute output of this planetary gear set



OUTPUT SHAFT ROTATION in this gear train is the sum of difference of the separate outputs that would be gotten when (1) the planetary carrier or arm *B* is held and shaft *A* drives, and (2) shaft *A* is held and gear *B* is driven.

For case (1), with carrier *B* held, the gearing acts as straight double-reduction gearing. Total reduction for the set is

$$\text{Reduction} = \frac{D}{C} \times \frac{F}{E} = \frac{23}{22} \times \frac{32}{13} = 2.57$$

For case (2), with *B* driving and *A* held, rotation *H* of the output shaft *G* per revolution of the driver is found from

$$H = 1 - \frac{C}{D} \times \frac{E}{F} = 1 - \frac{22}{23} \times \frac{13}{32} = 0.6115$$

Reduction is the inverse, or 1/0.6115 = 1.6355:1.

Example: To illustrate the procedure, assume the input from shaft *A* is 400 rpm, and the hydraulic steering motor is turning at its maximum rate of 420 rpm. Then rotation of the output shaft *G* due to rotation of the input shaft is 400 rpm/2.57 = 156 rpm.

Since 400 rpm of shaft *A* is in the travel speed range, let's also assume that the gearing between the hydraulic motor and the carrier gear *B* is shifted to give 3.88:1 reduction. Then total reduction between the hydraulic motor shaft and shaft *G* is 3.88 x 1.6355 = 6.348:1. Rotation of shaft *G* due to hydraulic motor input is then 420 rpm/6.348 = 66 rpm.

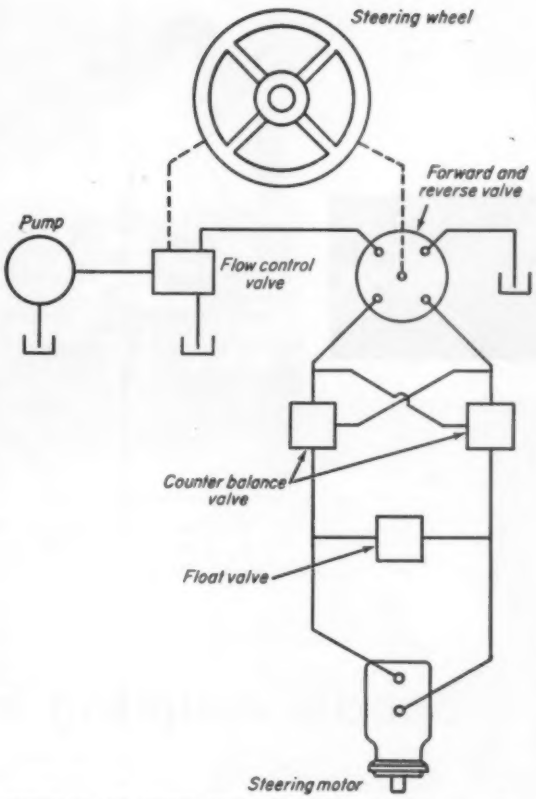
Now, total rotation of the output shaft on one side of the transmission is the sum of these two values and that of the other side is the difference, since the hydraulic motor drives one carrier in one direction and the other in the opposite. Therefore, one shaft turns at 156 rpm + 66 rpm = 222 rpm, while the other turns at 156 rpm −66 rpm = 90 rpm.

ing wheel. The wheel is for psychological reasons. All steering power is provided by the hydraulic motor. A four-way valve controls motor rotation, and a pressure-compensated, adjustable, flow control valve controls its speed. A cam at the end of the steering shaft increases opening of the valve, flow rate, and motor speed as the wheel is turned further from the straight-ahead position.

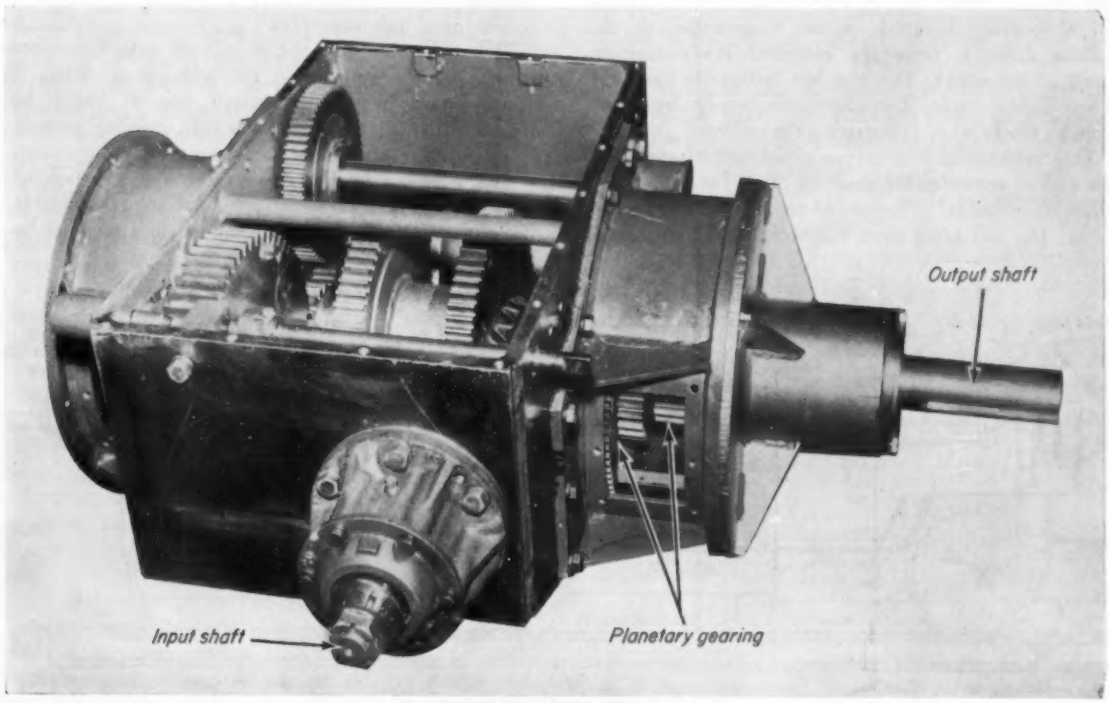
Hydraulic motor is an axial-piston type and operates at speeds to 420 rpm in either direction with the 12 gpm supplied to it. Maximum operating pressure is 2000 psi. Thus, maximum power used for steering is about 14 hp.

The decision to use hydraulic rather than electrical power for this auxiliary drive was based on (1) the presence of other hydraulically-operated auxiliaries on the paver, (2) small size of the hydraulic motor compared to the electric motor considered in the early design stages, and (3) the relative simplicity of the hydraulic circuitry required. In addition to providing infinitely-variable speed and reversing, the hydraulic circuit gives hydraulic locking of the auxiliary drive for straight-ahead travel, positive control of planetary speed so an overhauling or negative load cannot drive the tracks or wheels on one side ahead of the auxiliary drive, and it automatically disconnects the auxiliary drive when forward motion of the paver stops. Without this last feature, the steering wheel position would not be correct when the paver is restarted.

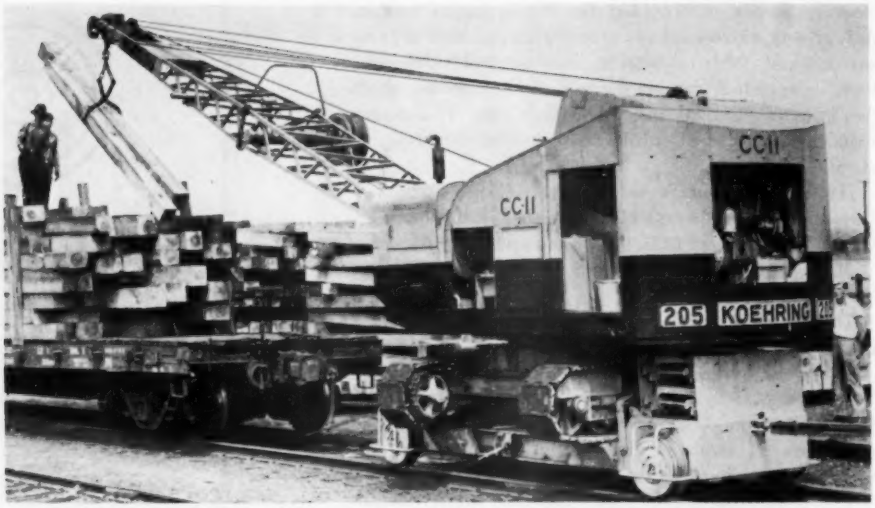
The paver on which this drive is used is loaded with bituminous material and while travelling under its own power lays a continuous strip of road surface. It can lay pavement at speeds up to 172 fpm. ▲▲▲



HYDRAULIC STEERING CIRCUIT. This diagram has been simplified to show only essential system elements.



PLANETARY DRIVE GEARBOX.



SPECIAL COUPLING lets the Model 205 RailAid crane drive itself along railroad track at speeds to 20 mph. Shown here on the railcar, it may be driven off under its own power and lift the railcar from the track in ten minutes or less.

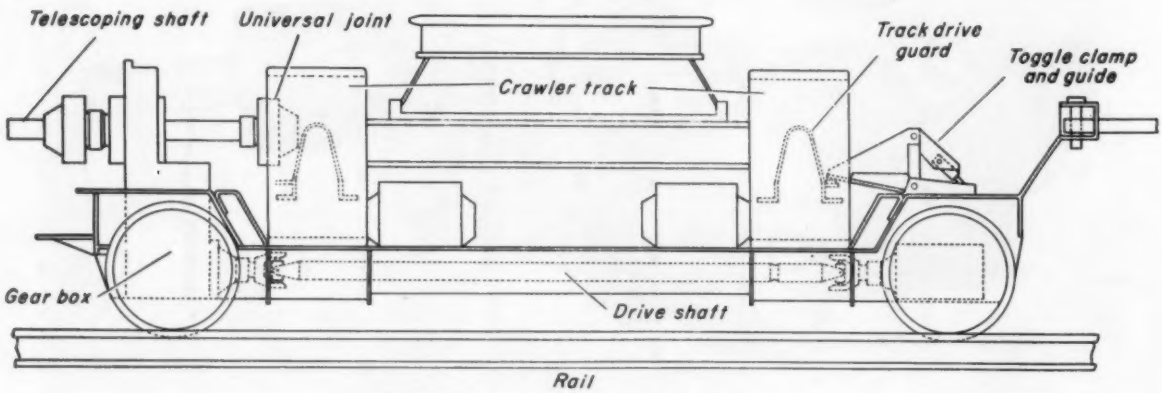
Special coupling lets crane drive rail car

A UNIQUE TELESCOPING SHAFT which accommodates a high degree of misalignment lets a 9-ton capacity crane propel itself along railroad tracks on a specially-designed railcar. Connection to the railcar drive is from the extended lower traction shaft of the crane. The clutches ordinarily used tor steering the crane disconnect the power from the crawler tracks while it is driving the railcar.

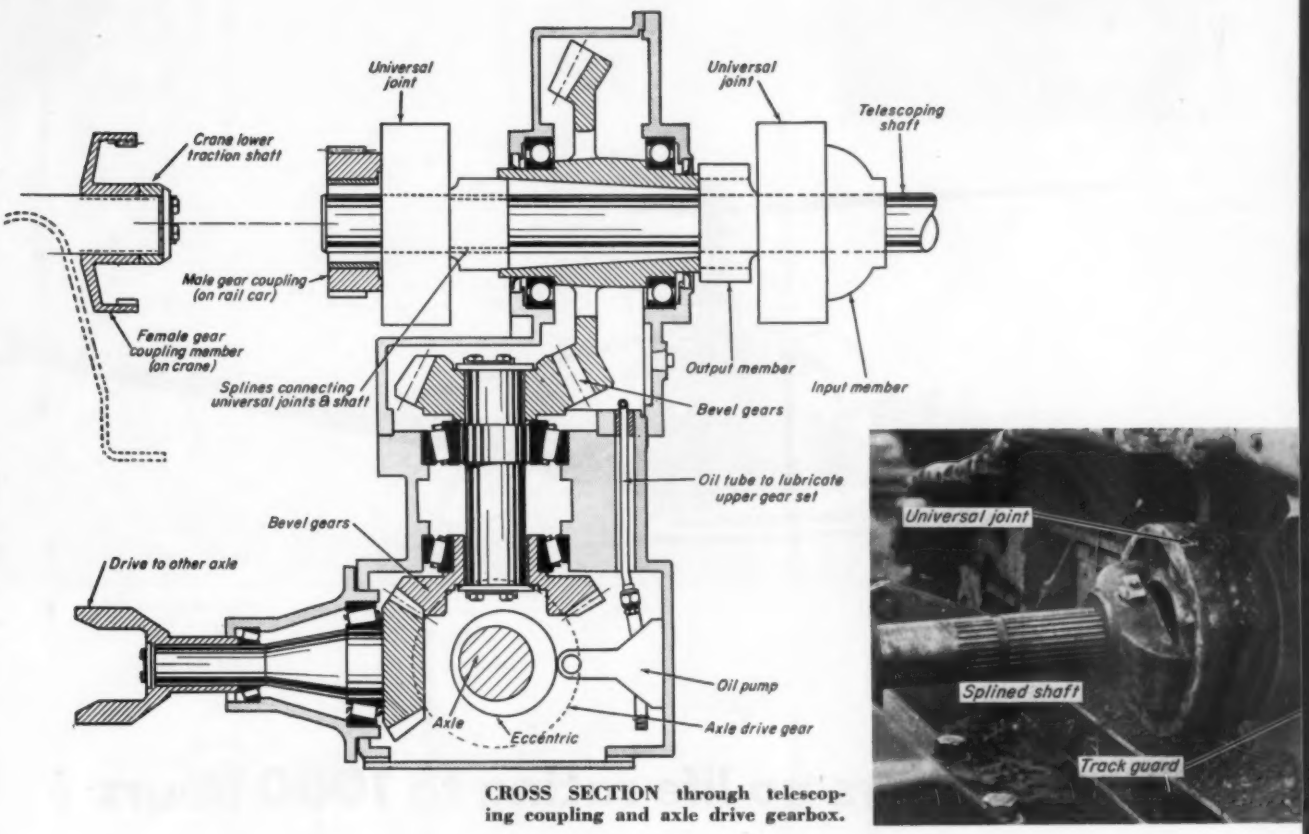
One member of a gear-type coupling is fastened to the end of the extended shaft on the crane. The other coupling member is connected to a special universal joint. The universal joint has a cross member with an opening in the center large enough to let the telescoping shaft pass through it when the assembly is disconnected from the crane. The cross is solid in a conventional universal joint.

The universal joint has a splined output member which fits the splines on the telescoping shaft. A spring-loaded pin on the output member lets it be locked to the shaft to hold the whole coupling assembly in position when it is not connected to the crane.

The telescoping shaft passes through the tapered bore of a bevel gear to a universal joint similar to the one mentioned. It is then splined to a member on



GENERAL LAYOUT of railcar and drive system.



CROSS SECTION through telescoping coupling and axle drive gearbox.

the far side of the universal joint, to drive the joint. Drive from the universal joint to the bevel gear hub is through a splined member.

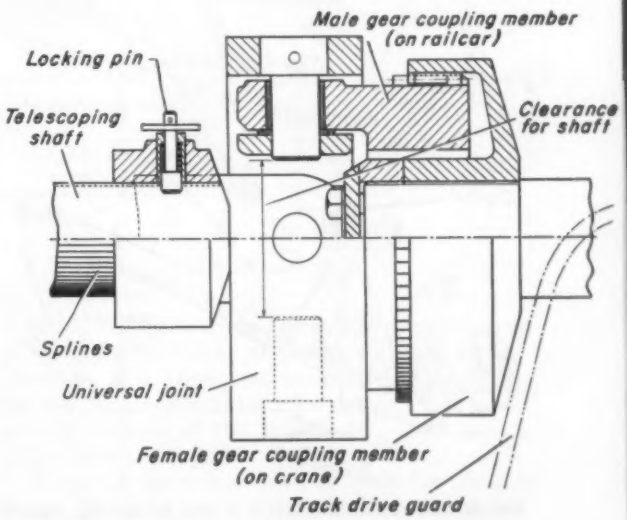
The bevel gear driven by this coupling drives a vertical shaft through another bevel gear. At the lower end of the vertical shaft, another bevel gear set drives one of the solid railcar axles. Another bevel pinion meshes with the bevel gear at the lower end of the vertical shaft to drive the other axle through a conventional propellor shaft assembly and bevel gear set.

Because the gear box containing the bevel gear sets connecting the telescoping shaft and axle is quite high, a small plunger pump driven by an eccentric on the axle is used to pump oil through a tube to the upper gear set.

To make the drive connection when the crane is driven onto the railcar, the pin which holds the telescoping shaft components in place is pulled to allow the shaft to be extended. When it is in its proper position, the pin snaps into place in another hole in the shaft to keep it from moving axially while driving.

Special guides on the railcar position the crane with fair accuracy when it is driven on and toggle clamps hold it in position while travelling. Ramps for driving the crane on and off are provided with the railcar. The crane may be operated while on the railcar or off it. A special lifting sling is also provided with the railcar so it can be lifted off the railroad tracks by the crane and not interfere with the normal rail traffic.

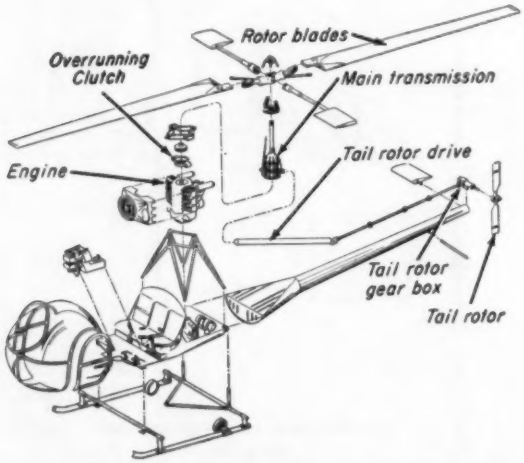
The unit using this ingenious telescoping shaft coupling is the Model 205 RaidAid made by *Koehring Div., Koehring Co.*, Milwaukee, Wis. ▲▲▲



SPECIAL UNIVERSAL JOINTS are necessary to compensate for misalignment, allow the shaft to telescope.

Floating gears up life rating to 1000 hours

FLOATING GEARS in the planetary transmission of the U. S. Army's H-23D Raven helicopter are one of the big reasons helicopters may now be operated for 1000 flight hours between overhauls. This was made known recently by the Army and the Bureau of Aeronautics. It is the only operational military helicopter with 1000 hour overhaul interval.



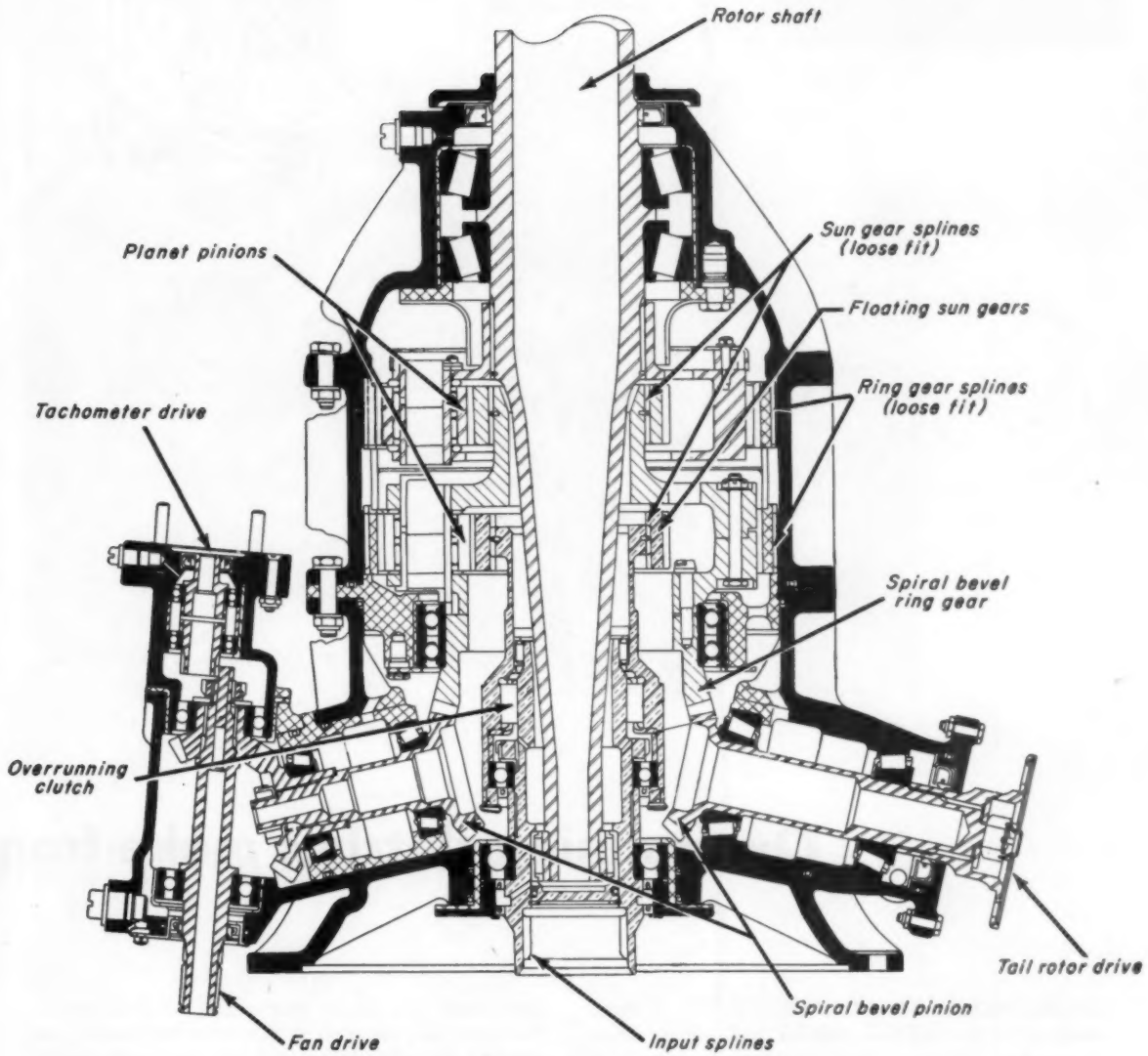
IMPROVED TRANSMISSION is one of the big reasons why the Hiller H-23D Raven is the only operational military helicopter OK'd for 1000-hr overhaul period.

Primary function of the transmission is to reduce input rpm from the engine from 3200 to 370 to drive the rotor. This is performed by two planetary gearsets. In addition to the planetary gearing, the transmission contains: an overrunning clutch to permit auto-rotation of the rotor blades in case of engine failure, and spiral bevel gear sets for driving tachometer, cooling fan, generator, and tail rotor.

Floating sun and ring gears in the planetary reduction sets lengthen life by allowing uniform loading of the planet pinions. Ordinarily, manufacturing tolerances on all the gearing and its mountings will cause unequal loading and thus shorten life. Despite the use of very close tolerances to prevent this, exact centering and load sharing can never be achieved.

The ring gears are floated by fitting them to the transmission case with loose-fitting splines. The sun gear shaft is supported only by a bottom bearing. This allows tooth mesh to seek its own center. The sun gear is also floated radially by mounting it on its shaft with loose-fitting splines.

Other design changes which improve life over the previously used transmission are reduction of the number of gear tooth contacts per minute and reduction of the Hertz stress on the gear teeth. Frequency of tooth contacts was reduced by using two



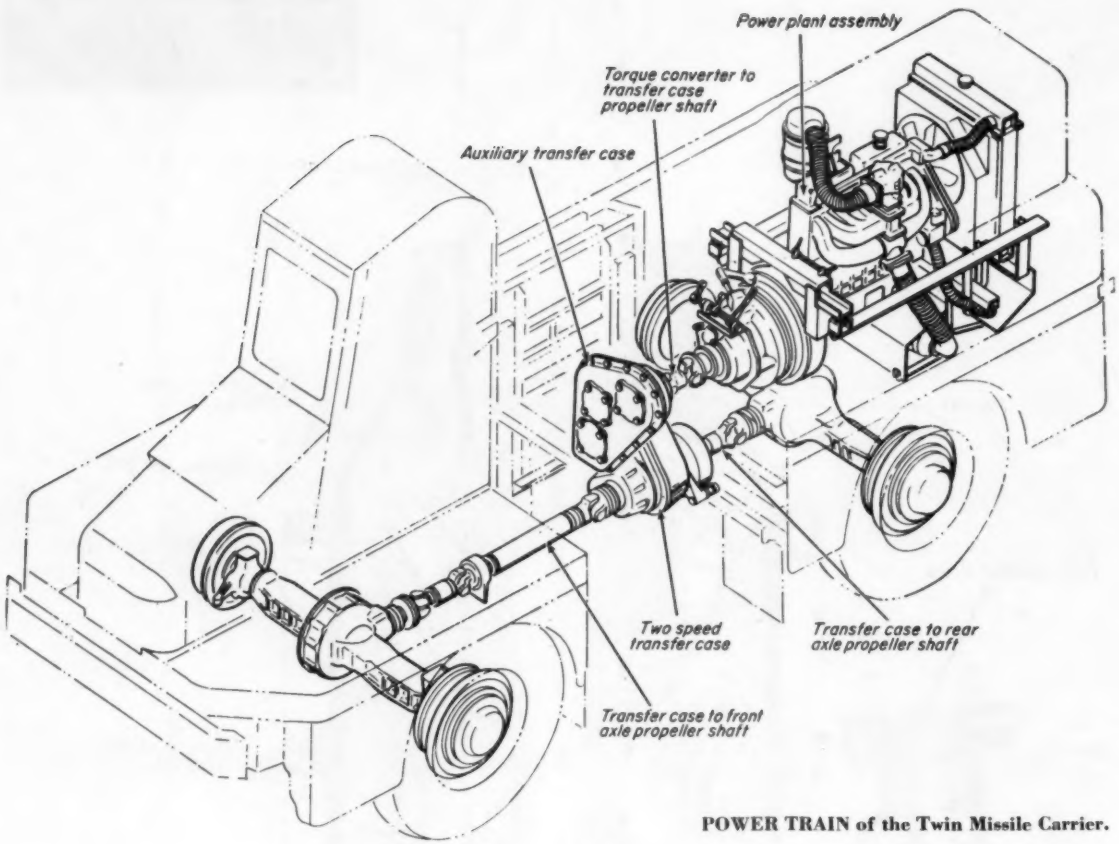
FLOATING GEARS in helicopter transmission are one feature which lengthens service life.

reduction stages instead of a single stage. In the earlier design, frequency of tooth contact was 8286 per min. In the new, first stage frequency is 6330 per min; second stage frequency is 5040.

Hertz stress was reduced from 222,500 psi to less than 160,000 psi in both stages by increasing gear face width by 10%, changing pressure angle from 20 to 22-½ deg, and using seven planet pinions in the second stage.

In addition to increased life and 40% more horsepower capacity, weight of the transmission was reduced by 25%. Designers attribute this to the reduction in over-all diameter of the unit which was possible because of the use of two rather than a single reduction stage.

Design of this transmission is by *Hiller Aircraft Corp.*, Palo Alto, Calif. *Vard Co.*, Pasadena, Calif., manufactures the unit for them. ▲▲▲


Power plant assembly
Torque converter to transfer case propeller shaft
Auxiliary transfer case
Two speed transfer case
Transfer case to rear axle propeller shaft
Transfer case to front axle propeller shaft

POWER TRAIN of the Twin Missile Carrier.

Overrunning clutches make front

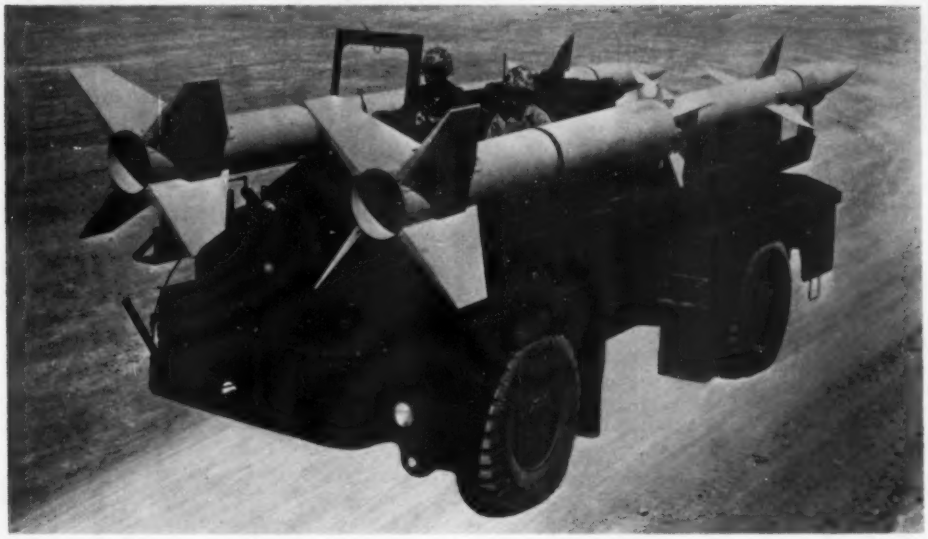
ENGAGEMENT AND DISENGAGEMENT of front wheel drive on military vehicles and others using front wheel drives to give increased traction and mobility used to be left to the discretion of the driver. Usually, it meant stopping the vehicle and moving a shift lever when front wheel drive was needed. Often, this stop to make the shift was enough to cause a vehicle to bog down. Also, the driver had to remember to disengage the front wheel drive when not needed to prevent excessive wear of front tires.

A fully automatic system using overrunning clutches has been developed to engage and disengage front wheel drives. It works when the vehicle starts up from a standstill or while it is in motion. The system is built into a power transmitting unit called a two-speed transfer case. The transfer case is a gear box which takes power from the vehicle transmission and drives two output shafts, one for front wheels, the other for the rear. It also includes gearing and a clutch to select either 1:1 or approximately 2:1 gear ratio in the transfer case.

The automatic system uses two overrunning clutches which connect internal gearing to the front axle drive shaft. One clutch is used for forward drive, the other for reverse. The correct clutch is engaged by an air cylinder when the main transmission is shifted. The other feature of the two-speed transfer case which makes this system work is that the front and rear axle gear ratios are slightly different. High and low ratios to the rear axle are 1.00:1 and 2.024:1. Ratios for the front axle are 1.068:1 and 2.163:1.

Thus, when the vehicle is travelling over a surface where traction is good, the rear wheels drive the vehicle and the surface drives the front wheels at

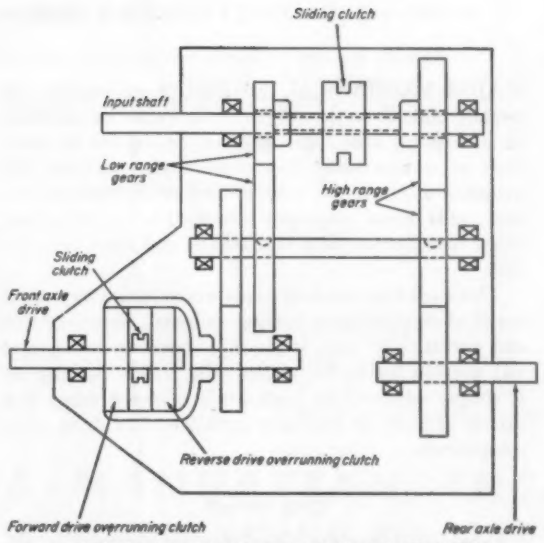
TWIN MISSILE CARRIER has automatic system for engaging and disengaging front-wheel drive.



wheel drive automatic

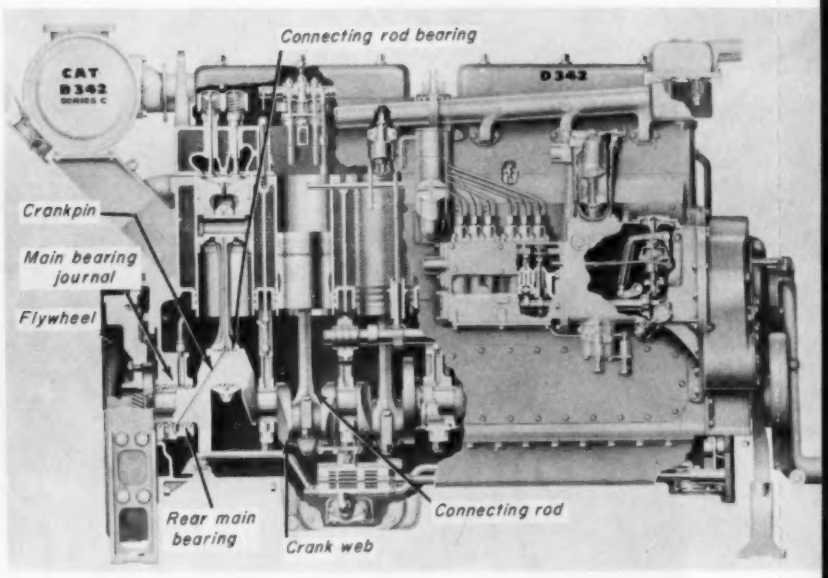
the same speed as the rear wheels. This speed is faster than the transfer case can drive the wheels because of the slight difference in gear ratios. Therefore, the clutch overruns and no power is transmitted to the front wheels until the rear wheels start to slip a little due to poor traction. But, just as soon as this happens, the overrunning clutch automatically supplies power to the front wheels.

This transfer case is used on a special side-lift fork truck developed by *Baker Industrial Trucks, Div. Otis Elevator Co.*, for The Marine Corps. The truck has forks on both sides and is labelled Twin Missile Carrier since its purpose is to pick up two missiles, carry them to a missile launcher, and load them on the launcher. The transfer case is also used on other military vehicles. It is a product of the *Transmission and Axle Div., Rockwell-Standard Corp.* ▲▲▲



TWO-SPEED TRANSFER CASE SCHEMATIC.

MOBILE EQUIPMENT DRIVE IDEAS
continued



CRANKSHAFTS AND MAIN BEARINGS in engines may be badly damaged if power-take-off components are not installed correctly.

Properly installed drive components

Increase engine life

By **W. E. IRWIN**, *manager, service department, Caterpillar Co., Industrial Engine Plant*

MAJOR MECHANICAL FAILURES of engines are usually blamed on the engine by its owner or operator. It is certainly true that there can be defects in materials or workmanship that cause engine failures, but evidence accumulated over a number of years proves that odds favor improper installation of associated drive components when crankshafts and main bearings fail.

There are four kinds of loads which commonly cause crank shaft and main bearing failures. These are (1) end thrust, (2) side loads, (3) bending loads, and (4) torsion loads. No matter who builds the engine, it simply cannot take high loads of these types that can be applied by improper installation of drive train components.

End thrust

Crankshafts and main bearings are designed to absorb the end thrust resulting from normal float of the crankshaft. End thrusts in either direction due to improper installation of clutches, torque converters, or other power-take-off devices can shorten life materially or cause breakage and other damage.

In a recent case, several diesel engines driving torque-converter-equipped excavators failed at the rear main (thrust) bearing. Front thrust flange of the bearing scored badly and broke off in some cases. Investigation showed the power train design was letting the torque converter pull on the crankshaft with a force of several thousand pounds. Design changes to solve the problem were a thrust bearing to absorb converter pull and elimination of a solid connection between the torque converter shaft and engine flywheel.

In another case, the rear main bearing flange broke off completely, the crankshaft broke through the web

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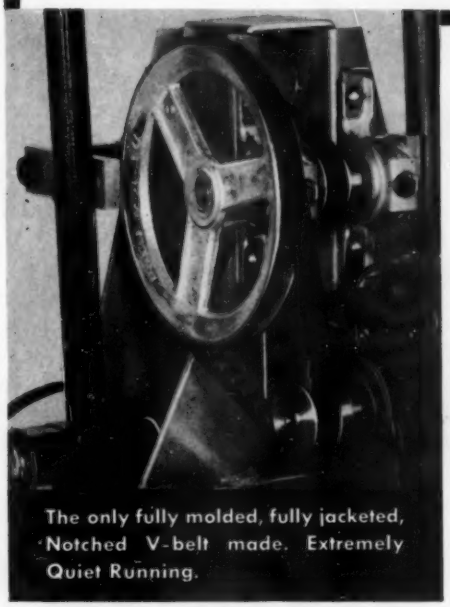

The only fully molded, fully jacketed, Notched V-belt made. Extremely Quiet Running.

Extensive tests have proved that R/M's CX Notched V-Belt outperforms, outlasts, other makes of belts by as much as 8 to 1. And wherever belt flexibility, ruggedness, small pulleys and *extremely quiet* vibration-free running are important factors, designers welcome the CX Notched V-Belt. Here's why:

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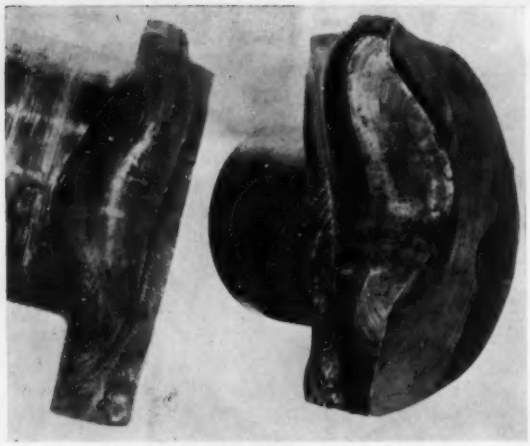


FIG. 1. IMPROPERLY SHIMMED COUPLING caused this crankshaft failure.

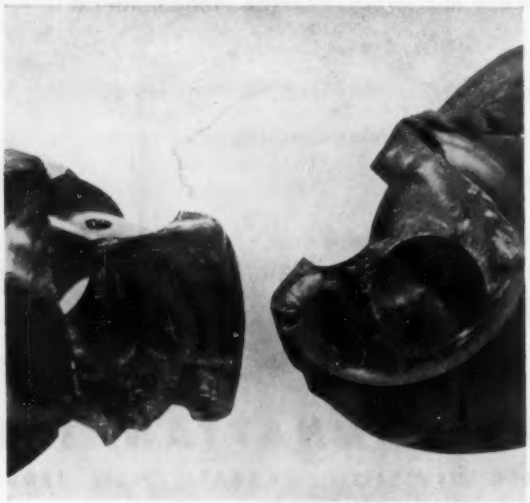
MOBILE EQUIPMENT DRIVE IDEAS

INCREASE ENGINE LIFE *continued*

adjacent to the rear main bearing, cylinder block cracked through the rear bearing web, and all main bearing caps and supports in the block were severely gouged, Figure 1.

Here the engine drove through a coupling into a torque converter. The coupling was not properly shimmed so the crankshaft could float, and the crankshaft was pushed forward.

FIG. 3. TORSIONAL VIBRATION FRACTURE is characterized by a break at a 45 deg angle, usually toward the rear of the engine.



Side loads

Oil film in crankshaft bearings can be broken down by side loading and cause seizure. Continued running will usually result in a jagged, complete crankshaft failure near the fillet.

Recently, a relatively new engine on a drilling rig had the rear main bearing seize. This ruined the crankshaft and cylinder block. Total damage amounted to nearly $10,000. Here, an on-the-job check showed that the inner drum of the air clutch driven by the engine was very poorly aligned with the outer drive ring.

Alignment of air clutches is very critical. The higher the air pressure in the boot, the more important accurate alignment becomes to keep side loads within safe limits. A misaligned clutch may cause failure of any component to which it is connected—engine, torque converter, pump, or other.

Bending loads

High bending loads are usually the result of misalignment of driven machinery. They can start cracks in the fillet at the main bearing journal which progresses through the web to the adjacent rod bearing journal. This type of failure is shown in Figure 2.

FIG. 2. HIGH BENDING LOADS usually result in a break which starts in the crankshaft fillet and progresses through the web.

Torsional loads

Excessive torsional loading or vibration will normally break a crankshaft at a 45 deg angle, see Figure 3. Wide use of torsional vibration dampers keeps the number of occurrences of this type of failure low. However, added driven equipment can overload the damper. Overspeeding the engine can also cause excessive torsional vibration. ▲▲▲

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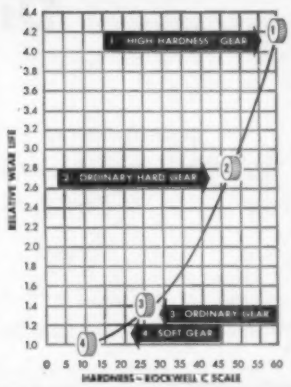
1. "High Hardness" gear . . . hardened *after* cutting. Precision processing permits maximum hardness while holding accuracy within extremely close tolerances.

2. Ordinary hard gear . . . hardened after hobbing and shaving. Hardness limited to maintain reasonable accuracy.

3. Ordinary gear . . . hardened before cutting. Hardening limited to maintain machinability.

4. Soft gear . . . excessive size required because of low capacity.



Positive, powerful, slower than motor speeds should mean one thing to you: Wagner Gearmotors. They are built to operate for years at peak efficiency. Advanced design and rugged construction with a minimum number of wearing parts, make this a certainty. Wagner Gearmotors have positive oil seals; continuous lubrication of all moving parts; extra-high capacity bearings; integral bearing housings; and rigid pyramid-mounted cast housings. Extra capacity bearings give them high overhung load ratings, too.

Wagner makes both integral-type and all-motor gearmotors, speed reducers and shaft-mounted speed reducers. They're available in single, double, triple or quadruple reductions . . . horizontal or vertical foot or flange mountings. Another important factor: prompt shipment. Standardized components permit immediate assembly of all standard sizes and types; you get equipment when you need it.

Want to know more? Call your nearby Wagner Sales Engineer; he will be glad to help you select the right drive for your application. Bulletin MU-227 gives full information.

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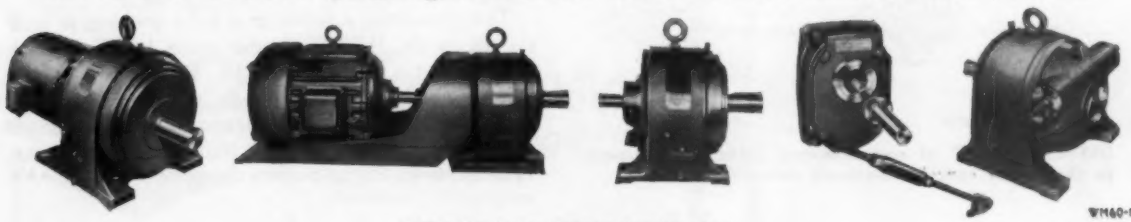
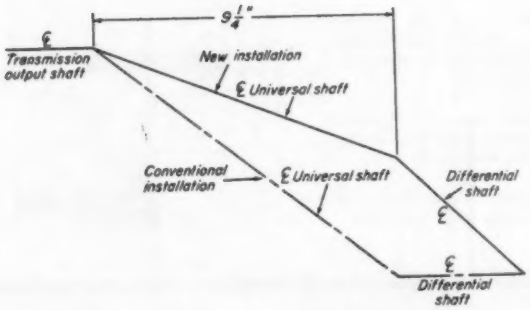


WH60-18

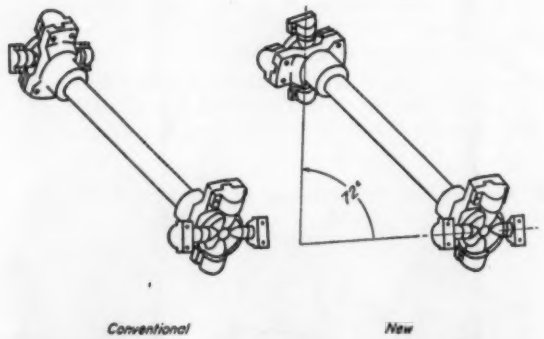
Circle No. 35 on Reader Service Card

DRIVE PROBLEM on this H-50 Hough Payloader was solved by an unusual universal shaft arrangement.

Displaced universal stops drive shaft vibration



UNCONVENTIONAL universal shafting reduced angularity but introduced varying rotational velocity at the differential shaft.



DISPLACEMENT of one universal joint with respect to the other, cancels rotational velocity variations.

DRIVE SHAFT VIBRATION has been eliminated in a new tractor shovel by rotating one of the universal joint crosses 72 deg from normal. The transmission output flange was so close to the differential input flange that a conventional layout (with the two flanges parallel) would have made operating angles too high.

To reduce angularity, the entire axle was tilted. This pointed the differential input shaft and flange upward. Angle of tilt was selected so the two universal joints would operate at equal angles. Although this reduced joint angularity to an acceptable value—about 5 deg for each joint—the unequal accelerations inherent in the cardan-type universal joints do not cancel.

Analysis showed that by rotating the joint at one end of the shaft approximately 70 deg, unequal acceleration could be cancelled. Since there was a 10-spline slip joint in the universal shaft, the 72 deg displacement was obtained by assembling the joint two splines off normal.

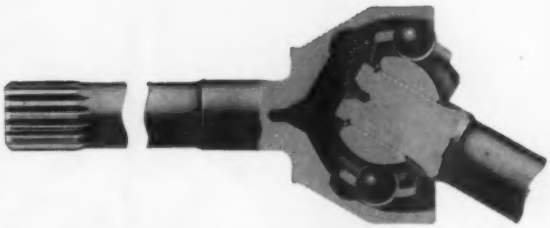
This interesting solution to a drive problem is used on the model H-50 Payloader made by *The Frank G. Hough Co.*, Libertyville, Ill. This tractor shovel features 4-wheel drive through a torque converter and complete power-shift transmission. Maximum load capacity is from 6000 to 10,000 lb. Either a gasoline or diesel engine powers the vehicle. ▲▲▲

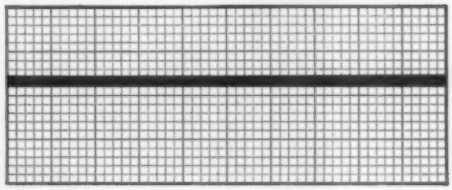
RZEPPA Universal Joints Transmit Torque Smoothly—*Even At High Angles!*

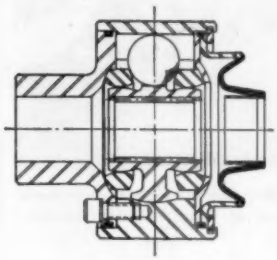
Rzeppa universal joints transmit 100% precision-smooth torque continuously—at angles of 35° and higher! Constant velocity action completely eliminates chatter, roughness and vibration. Size for size, you get longer shaft and bearing life, higher torque capacity with Rzeppa joints than with any other type!

The secret of Rzeppa's uniform power flow is that the driving balls are always in the bisecting plane of the driving and driven shafts. No matter what the shaft angle, torque flows evenly at constant velocity.

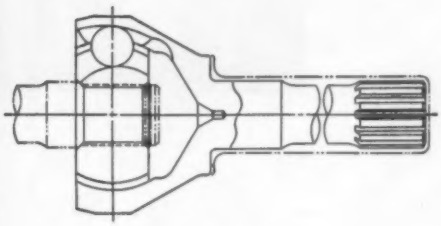
Rzeppa constant velocity joints are available in a wide variety of sizes, styles, angles and speeds. Rzeppa joints have been used successfully in equipment ranging from giant road-building and mining equipment to the most intricate aircraft and missile applications.



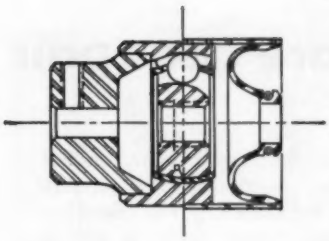




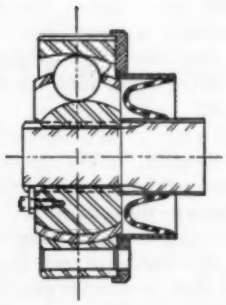
"MX" Type CV Joint (⅜" to 3½" swing diameter) . . . designed primarily for high speeds, low angles . . . blowers • compressors • servo motors • pumps • control devices • frequency converters • missiles • aircraft • dynamotors



Bell-Type CV Joint (15/16" to 2½" axle shaft diameters) . . . designed for high-angle driving steering axles used in road building machinery • mining machinery • industrial • automotive applications



"OV" Type CV Joint (2⅛" maximum swing diameter) . . . designed for smaller applications . . . ordnance • machine tools • servo mechanism • farm equipment • automotive equipment



Disc-Type CV Joint (from 2⅛" to 16¼" swing diameter) . . . designed for all types of industrial drive applications where constant velocity and trouble-free service are required.

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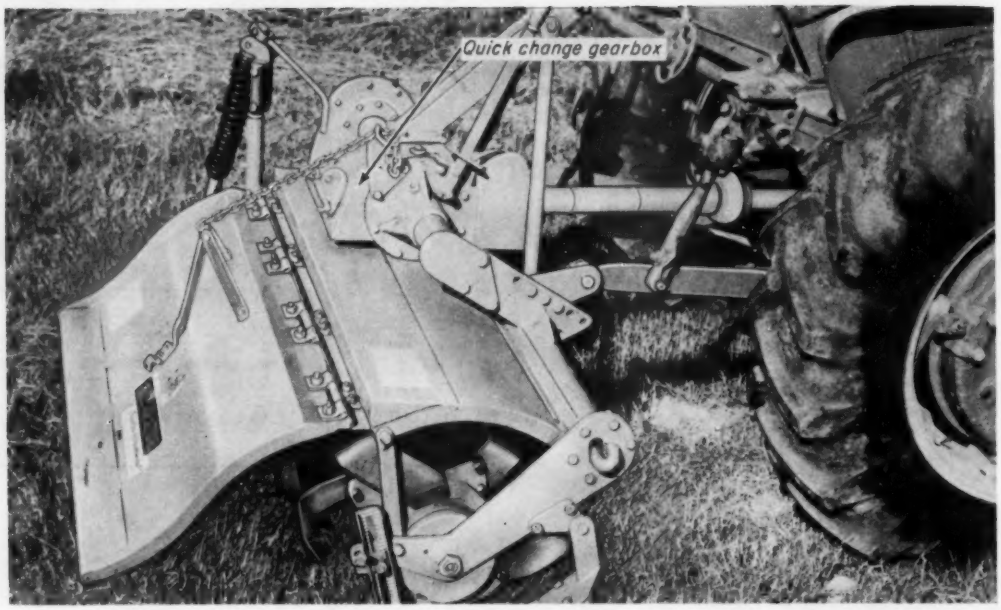
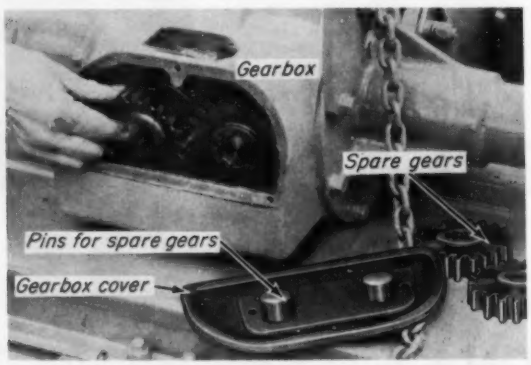


TILLING ATTACHMENT for farm tractors have quick-change gear box to let the operator quickly select one of four different speeds.

Quick-change gearbox stores spare gear pair

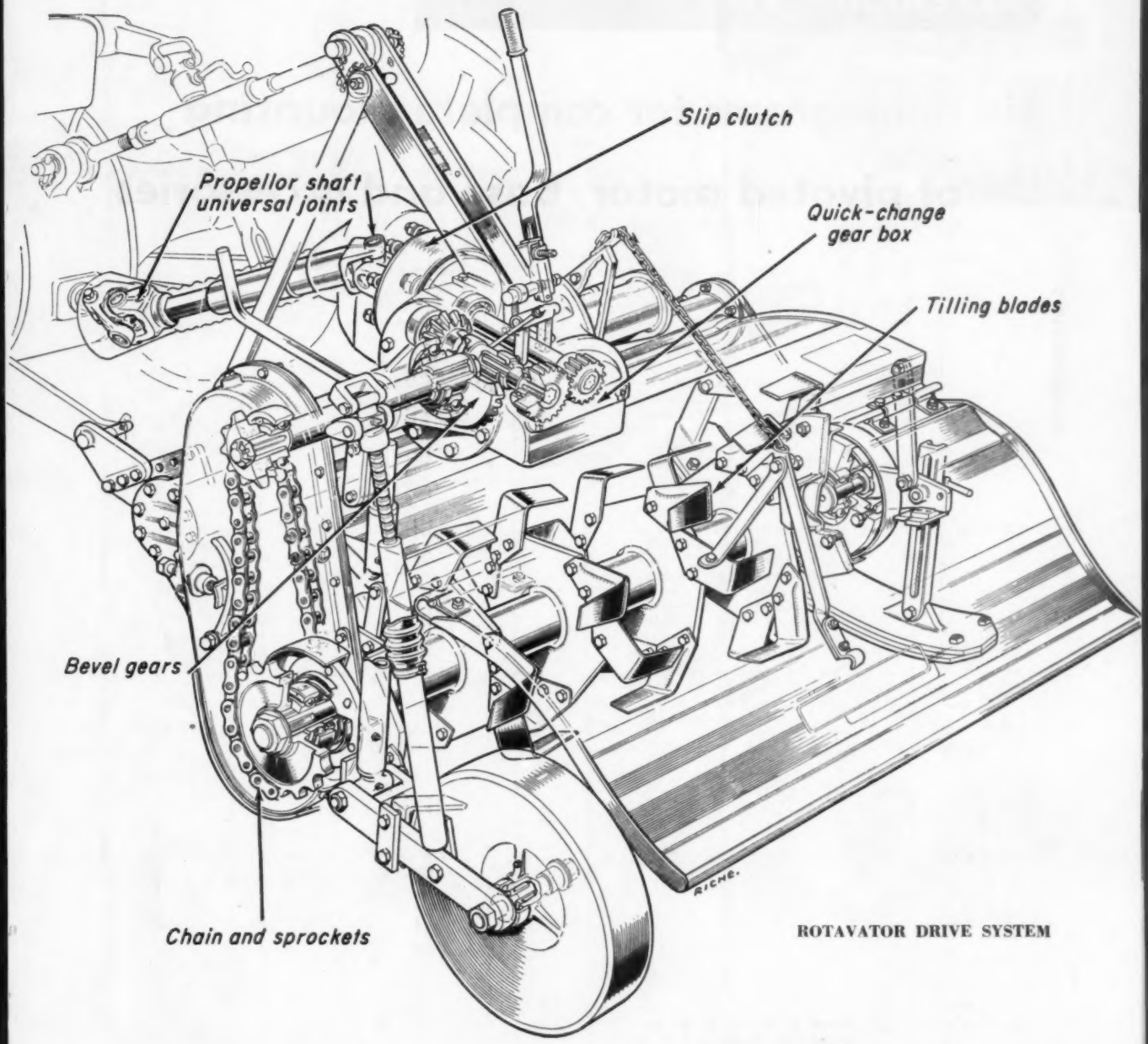
FOUR SPEEDS can be quickly selected with a quick-change gearbox which lets a pair of gears be quickly interchanged and also holds another pair of gears to give two other ratios. This gear box is used on a tilling attachment which is hitched behind a farm tractor and driven from the tractor power takeoff.



GEARBOX COVER is quickly removed by loosening three captive thumbscrews. Pins on inner surface of cover hold a pair of gears and keep working gears from sliding off splined shafts.

The complete drive system consists of a universal shaft which couples to the tractor power takeoff; a slip clutch to protect the tractor drive as well as the attachment if an obstacle such as a stone or stump should be hit by the tiller blades; the quick-change gearbox which includes a bevel gear set to drive a shaft extending to the side of the attachment; and a chain and sprocket drive to the rotor on which the tilling blades are mounted.

The two sets of change gears give speeds of 140, 160, 180, and 205 rpm to the rotor. Speeds are quickly changed by removing the gearbox cover, held by captive thumbscrews, slipping the gears off their splined shafts and interchanging them, or substituting the other pair. Pins on the inside of the gearbox cover hold the gear pair that is not in use. Gears are a slip fit on splined shafts in the gearbox. Since they are straight spur gears, there are no thrust loads. However, the cover and the pins for storage of the unused pair of gears are designed to fit fairly close to the faces of the operating gears to keep them from sliding off the shafts.



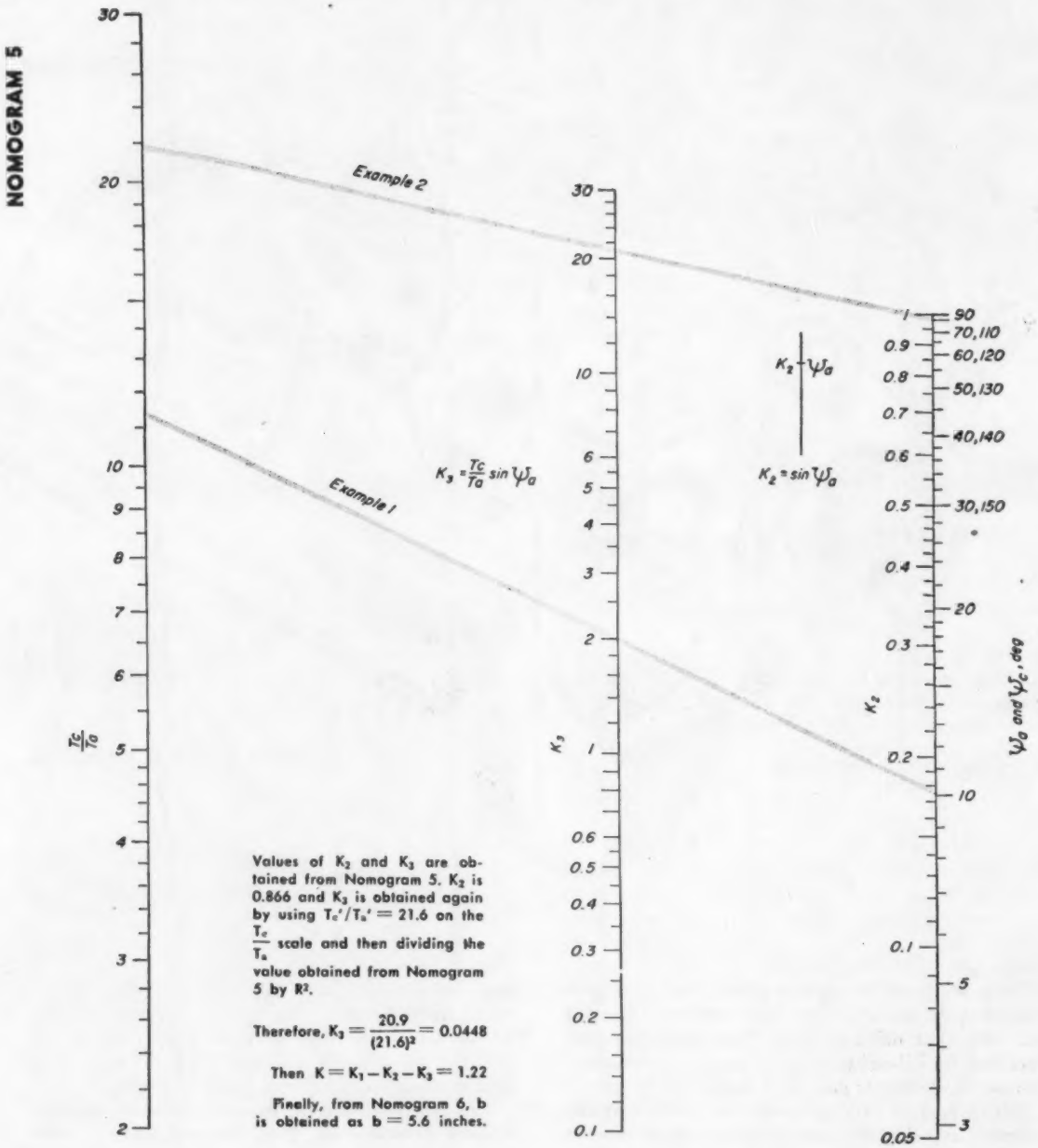
ROTAVATOR DRIVE SYSTEM

The gears must be used in pairs. That is, a gear from one pair cannot be used with one from the other pair to give a different ratio. They are, therefore, identified by oil-resistant paint to give instant recognition of which gear goes with which.

This method of varying speeds was selected by the designers as being the most economical and convenient one consistent with operating conditions of the tiller. Speeds must be changed for varying soil conditions, but still at wide intervals. Once properly set, the tiller may operate for half a day or more in a field at the set speed before a change is needed.

The unit is called a Rotavator by its manufacturers, *Howard Rotavator Co., Inc.*, Harvard, Ill. ▲▲▲

Six nomograms for complete mounting of pivoted motor, base and accessories



Values of K_2 and K_3 are obtained from Nomogram 5. K_2 is 0.866 and K_3 is obtained again by using $T_c'/T_a' = 21.6$ on the $\frac{T_c}{T_a}$ scale and then dividing the value obtained from Nomogram 5 by R^2.

Therefore, $K_3 = \frac{20.9}{(21.6)^2} = 0.0448$

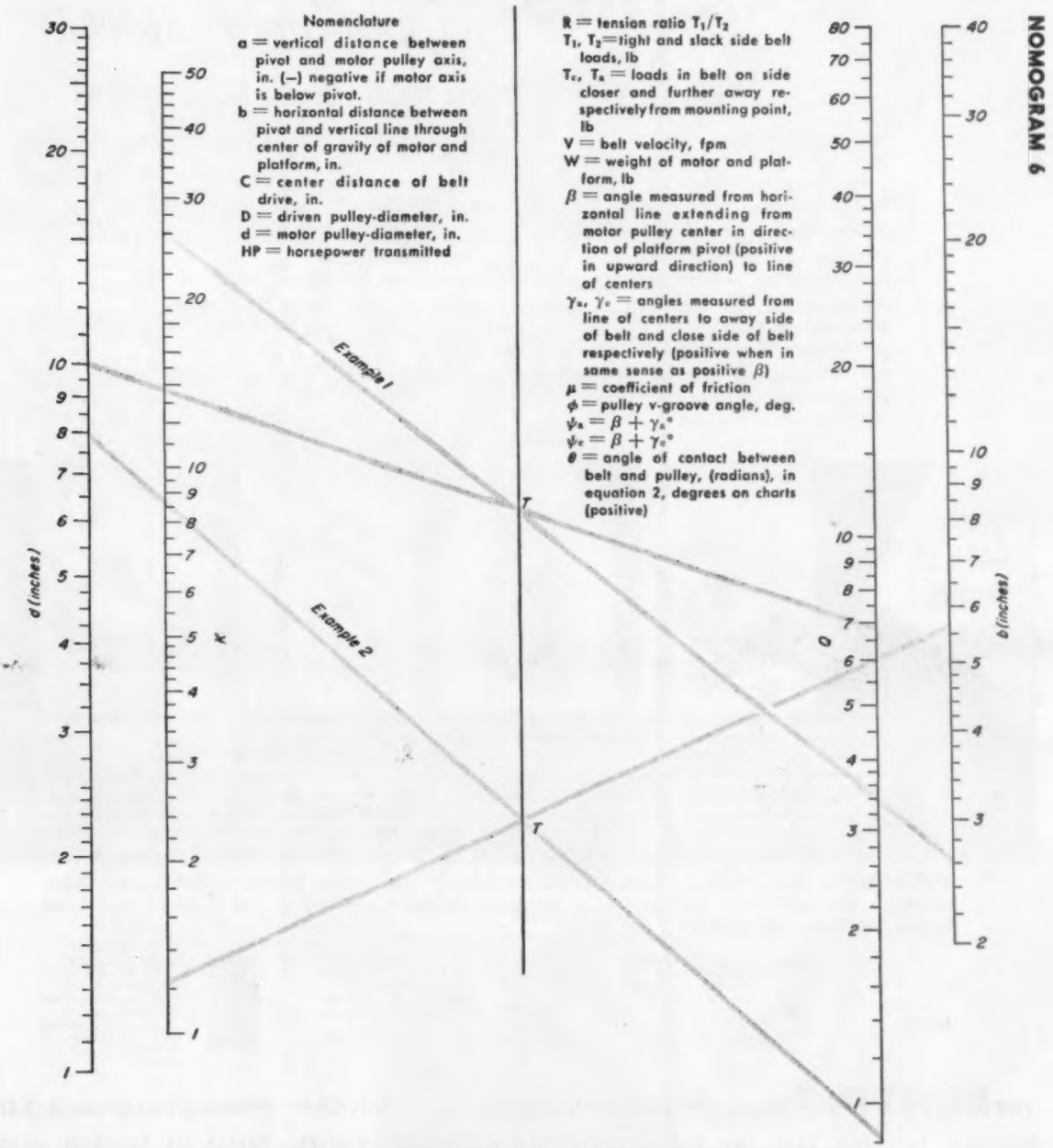
Then $K = K_1 - K_2 - K_3 = 1.22$

Finally, from Nomogram 6, b is obtained as b = 5.6 inches.

Part 3

These two nomograms complete this six-nomogram set

By J. N. ARNOLD, *professor, and*
ALLAN C. DUNK, *assistant professor, Purdue University*


Nomenclature
a = vertical distance between pivot and motor pulley axis, in. (–) negative if motor axis is below pivot.
b = horizontal distance between pivot and vertical line through center of gravity of motor and platform, in.
C = center distance of belt drive, in.
D = driven pulley-diameter, in.
d = motor pulley-diameter, in.
HP = horsepower transmitted
R = tension ratio T1/T2
T1, T2 = tight and slack side belt loads, lb
Tc, Ta = loads in belt on side closer and further away respectively from mounting point, lb
V = belt velocity, fpm
W = weight of motor and platform, lb
β = angle measured from horizontal line extending from motor pulley center in direction of platform pivot (positive in upward direction) to line of centers
γa, γc = angles measured from line of centers to away side of belt and close side of belt respectively (positive when in same sense as positive β)
μ = coefficient of friction
φ = pulley v-groove angle, deg.
ψa = β + γa°
ψc = β + γc°
θ = angle of contact between belt and pulley, (radians), in equation 2, degrees on charts (positive)
Example 1
Example 2
d (inches)
K
T
T
C
b (inches)
NOMOGRAM 6

For free copies of all six nomograms, Circle No. 400 on Reader Service Card

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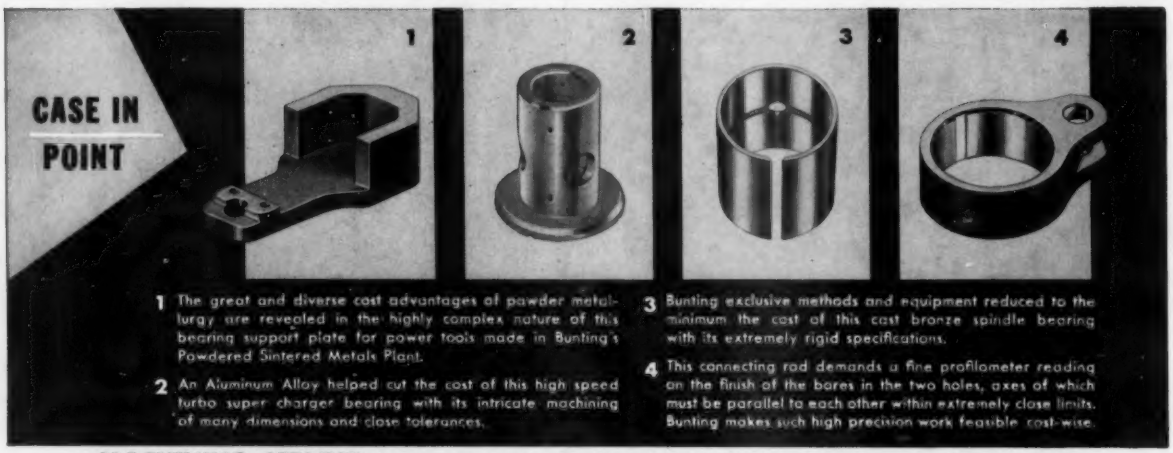
CASE IN POINT



1 The great and diverse cost advantages of powder metallurgy are revealed in the highly complex nature of this bearing support plate for power tools made in Bunting's Powdered Sintered Metals Plant.

2 An Aluminum Alloy helped cut the cost of this high speed turbo super charger bearing with its intricate machining of many dimensions and close tolerances.

3 Bunting exclusive methods and equipment reduced to the minimum the cost of this cast bronze spindle bearing with its extremely rigid specifications.

4 This connecting rod demands a fine profilometer reading on the finish of the bores in the two holes, axes of which must be parallel to each other within extremely close limits. Bunting makes such high precision work feasible cost-wise.

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No. 158—GENERAL CATALOG—Complete listings of Cast Bronze and Sintered Bronze Stock Bearings and Bars and Bunting Bearing Aluminum Bars available from stocks of local distributors all over America.

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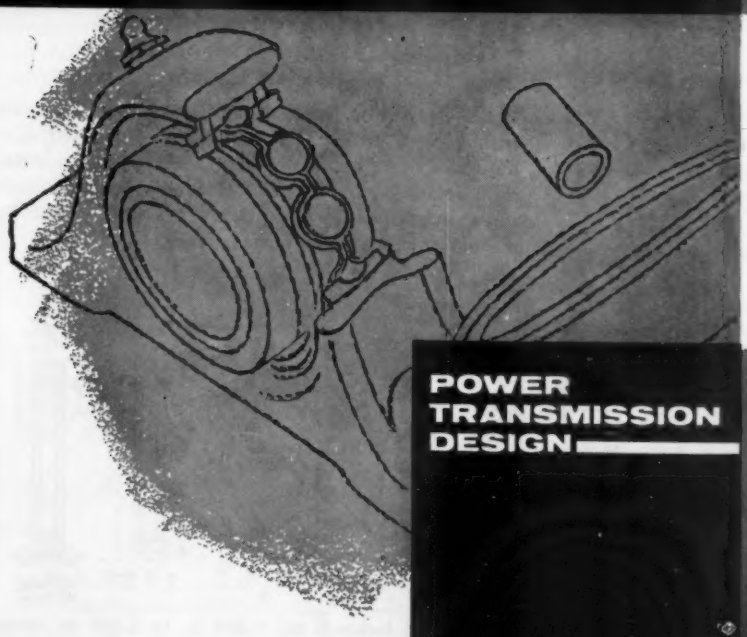
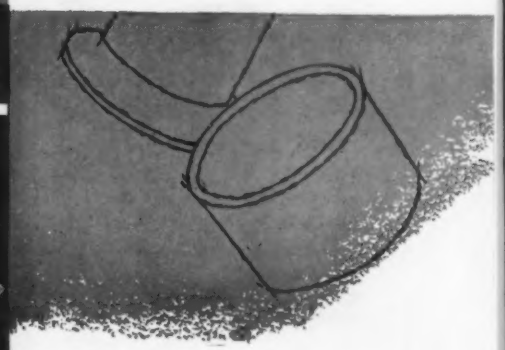
BEARINGS

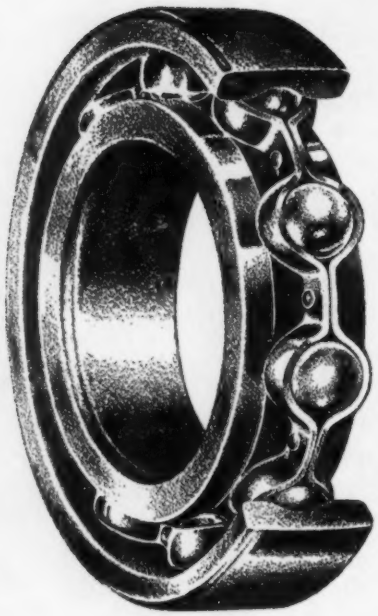
DESIGN/APPLICATION



REGULAR MONTHLY SECTION OF IDEAS AND DEVELOPMENTS

POWER TRANSMISSION DESIGN





Mount bearings carefully—

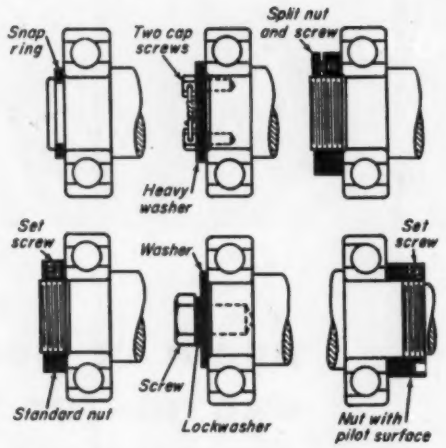
Mounting tips for ball bearings, cylindrical and spherical roller bearings, with thrust loads . . .

MOUNT BEARINGS CAREFULLY. There are a few right and many wrong ways. More bearings fail due to faulty installation, or faulty mounting, than for any other reason, except faulty lubrication.

When bearing inner rings are properly press-fitted, they will not creep excessively or turn on the shaft under normal conditions. In such cases a retaining ring is all that is needed.

However, when there is thrust, resist the axial load with a single bearing and allow the others to perform radial duty only. Under these conditions, especially where thrust is reversing, use a positive clamping member instead of just a snap ring.

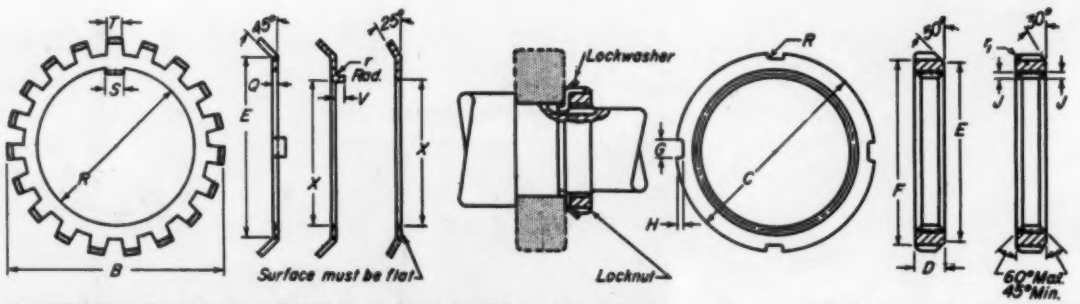
Shown in this article are standard mounting accessories discussed in Section No. 8, revision 3, AFBMA Standards for Bearing Mounting Accessories.



DIFFERENT TYPES of clamping methods.

Bearing Creep

The very slow creep of a bearing ring, mounted with a close push fit, should not be confused with the faster rapid turning of a ring improperly mounted on a rotating part. The slow creep represents a light force, controlled by the degree of fit used, or by normal clamping of the bearing rings.



W-00 SERIES lock washers are 0.042 in. to 0.156 in. thick. N-00 SERIES locknuts are 0.209 in. to 1.260 in. thick.

stop the No. 2 cause of failure

Wear caused by slow creep is too slight to be of consequence. The latter creep, however, is due to a definite and powerful rotative force. It acts on the inner ring, like an internal gear with the shaft driving the bearing ring.

Experience shows that the effects of a loose fit of a bearing ring on a rotating shaft cannot be counteracted by keying. Not only do keyways weaken rings due to the interruption of the section, but the forces are so great that they may shear the keys.

Housing dimensions are not as easy to hold as shaft dimensions, particularly for machines with close tolerances. Shafts are set up and ground on centers; housings are set up on different locating faces and are finished by different methods.

Housing details of most importance are

(a) Roundness
(b) Straightness
(c) Alignment
(d) Rigidity

If the housing is not round, the bearing becomes out-of-round when installed. The result is the bearing becomes excessively stressed at certain points and may fail prematurely. If a bearing is mounted in a housing which is tapered, it may be supported at one end only. Under load, the bearing becomes distorted.

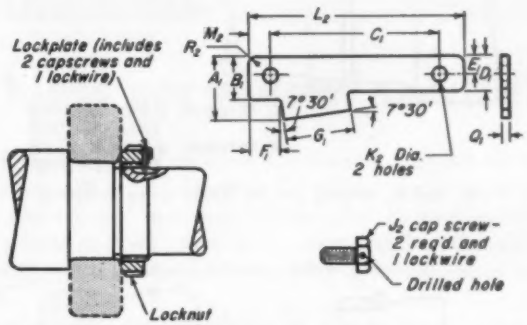
Misalignment due to errors in housings is usually found in two forms. (1) Housings may be parallel but out-of-line. (2) Axis of the housings may not be central or parallel with true axis of the shaft.

In both cases, when the shaft and bearings are mounted in the housings, bending stresses are set up in the shaft, which, if severe enough, can result in early fatigue failure.

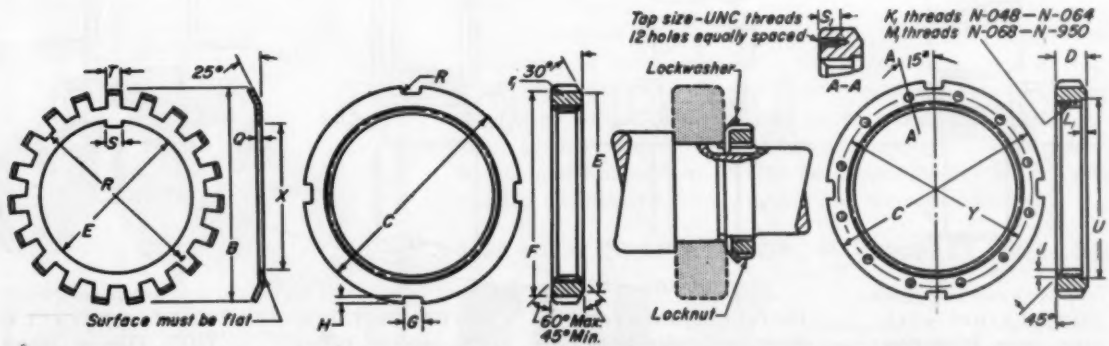
A housing must have enough metal to resist distortion and absorb vibration. Light housings may be braced by webs or fins so that deflection under load is confined.

AFBMA Accessories Standards

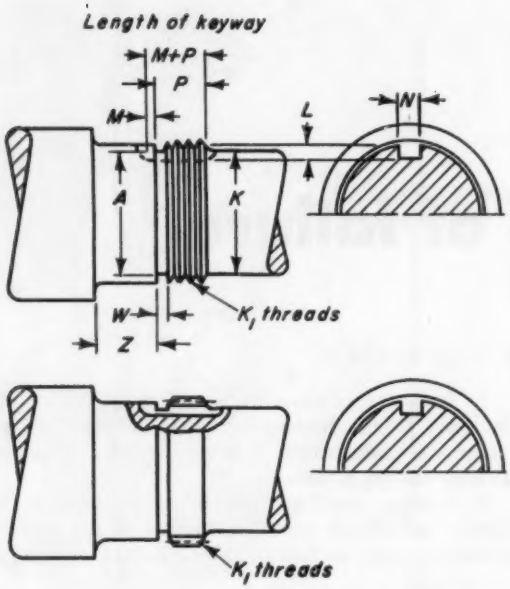
K_1 threads shown in the illustrations are derived from the Screw Thread Standards for Federal Serv-



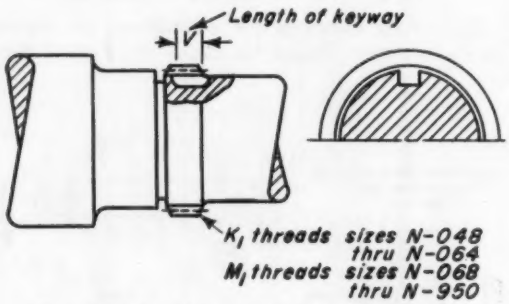
P-00 SERIES lockplates can be bent to radius of ½ stock thickness without fracture, are 1/8, 5/32 and 3/16 in. thick.



W-000 SERIES lockwashers are 0.125 in. ±.010 thick. N-000 SERIES locknuts range from 0.766 in. to 3.953 in. thick.



K_1 threads on shaft are for N-00 series locknuts.



K_1 and M_1 threads are for N-000 series locknuts.

MOUNT BEARINGS CAREFULLY *continued*

ices. These threads are American National, Form NS, Class 3, with thread length based on 45 deg chamfer. M_1 threads are Acme Class 3G, General Purpose.

Lockplates are made of low carbon steel. Lockwashers are made of low carbon steel that will bend without fracture, either way of the grain, over a radius equal to ½ stock thickness.

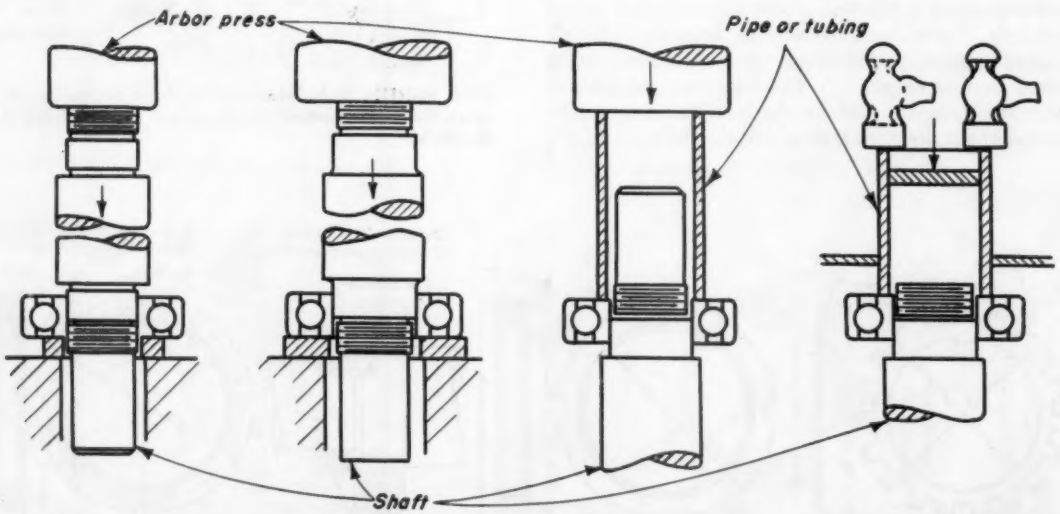
In certain applications, the W-Type lockwasher requires reverse bending of the tang on the outer periphery of the washer. For this use, the lockwasher should be annealed after forming. Recommended annealing temperature is 1300F., held at temperature for 15 minutes in deoxidized atmosphere, cooling in air.

To check, mount locknut on tight-fitting threaded arbor. (A tapered arbor is not acceptable.) Apply indicator against chamfered face. Side runout is difference between the maximum and minimum reading when rotating the arbor one revolution. Any part of the surface must be within the following tolerances for ball, cylindrical and spherical roller bearings:

N-00 thru N-06	.002 in. max.
N-07 thru AN-22	.004 in. max.
AN-24 thru N-44	.006 in. max.

When either the nut or the shaft is made of stainless steel, aluminum, or other material having a tendency to seize, reduce maximum thread diameter of the shaft, major, and pitch diameters by 20% of the listed pitch diameter tolerance.

Locknut sizes 15 thru 30 were originally made with 11 threads and numbered N-15, etc. The 11-thread nut was discontinued and replaced by the 12-thread nut, which was renumbered AN-15, etc. ▲▲▲



INSTALLATION with arbor press. Inner ring rests on flat blocks.

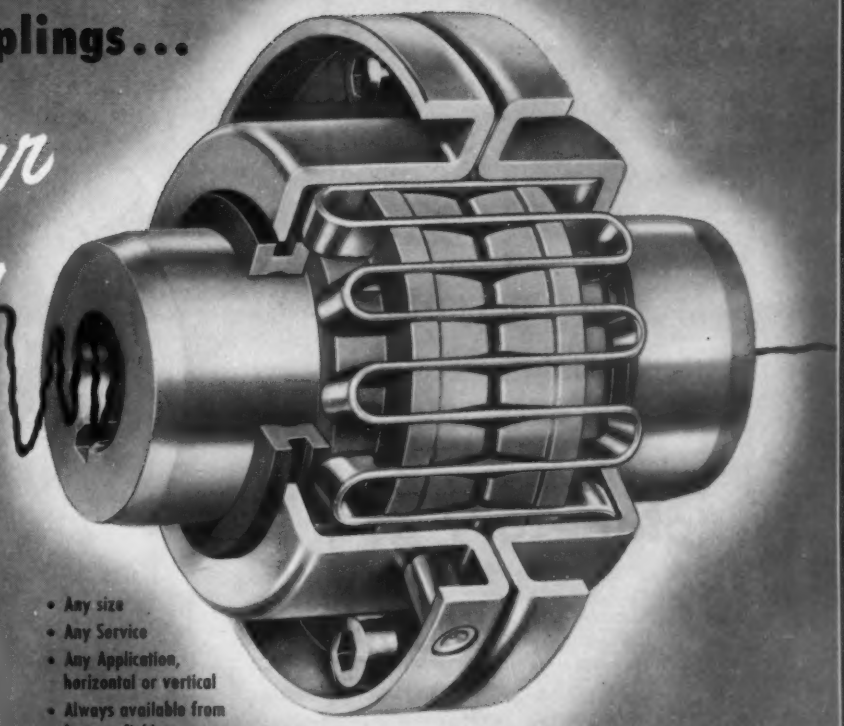
INSTALLATION with inner and outer rings resting on blocks.

ENDWISE INSTALLATION, pipe or tubing against inner ring.

HAND INSTALLATION. Pipe or tubing is tapped gently.

Falk Steelflex Couplings...

Protect your machinery in 2 ways



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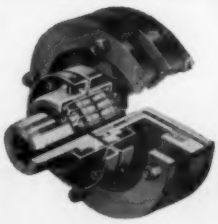

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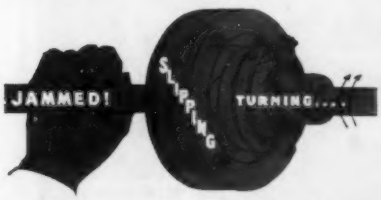
Falk Controlled Torque Couplings prevent damage from overloads

In applications where danger from overloads exists, use the FALK Type FT Controlled Torque Coupling. The Type FT has all the features and advantages of standard FALK Steelflex couplings—and, in addition, has an adjustable friction slip clutch, enabling the operator to set the coupling to slip at any predetermined overload.

This controlled-torque principle not only prevents transmission of dangerous shocks and limits overloads; it eliminates the breaking of shafts caused by jamming of driven equipment.

An outstanding advantage of the Type FT Coupling is that, as soon as the cause of the overload is removed, the entire coupling will rotate and transmit power without replacing parts or repairing coupling.



There's real economy in using Type FT Controlled Torque Couplings. Many users have reported that these couplings paid for themselves the very first time they slipped (under overload) because of the protection against damaged driving or driven machinery!

...cost less per year of service!

You get *double protection* when you connect your driving and driven machinery with a Falk Steelflex Coupling—the all-steel coupling with the exclusive grid-groove design! First, its *torsional resilience* smothers shock and vibration; and second, the Steelflex design prevents damage and lowered efficiency by accommodating shaft misalignment.

Why have increasing numbers of key men in industry standardized on Falk Steelflex Couplings? Their experience has proved that Falk Steelflex Couplings prolong the service life of their machinery... are trouble-free and need minimum maintenance... are easy to install, lubricate and disconnect... and *cost less per year of service* than ordinary couplings.

One basic Steelflex design—the type F, in its many sizes—is adaptable to more than 90% of all industrial applications. For applications involving danger from overloads, Modified Type FT Controlled Torque couplings (see column at left) are ideally suited. There are numerous other special or dual purpose Steelflex couplings for unusual applications. **Write to Department 247** for engineering bulletin, including selection and dimension tables.

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- Steel Castings
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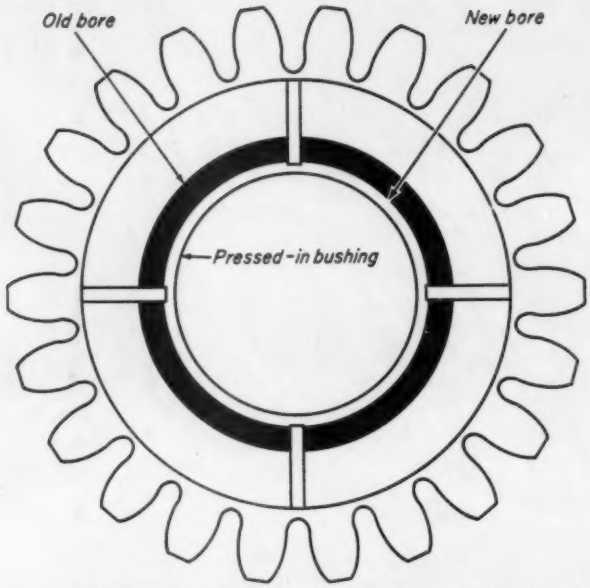
Circle No. 19 on Reader Service Card

Bearing change stops planetary gear troubles



PRESSED-IN BUSHING lets more material be left in the gear to strengthen it.

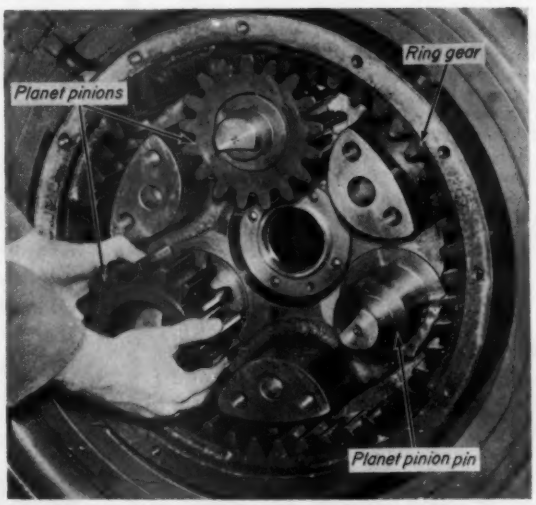
EARLY FATIGUE FAILURES of the planet pinions in a planetary gear set used as the final reduction in an off-the-road truck were prevented by a relatively simple bearing change. Preliminary design studies showed that if previously-followed practice of using a steel planet pinion running on a bronze pin were used, there just wasn't enough material in the gear by the time the pin was made as large as it had to be to handle the load. Space within the wheel made it impossible to increase the outside diameter of the planetary set and pinions to get additional strength.

The solution was to use a steel pin and a pressed-in steel-backed bronze bushing in the pinion. This let the diameter of the pin be reduced from a nominal 3 in. to 2½ in. while retaining adequate strength due to the material change. The gear bore was decreased by almost the same amount to give the required increase in strength. Gear bore is a nominal 2⅝ in. to allow for the thickness of the bushing. No service difficulties have been had with this revised design.

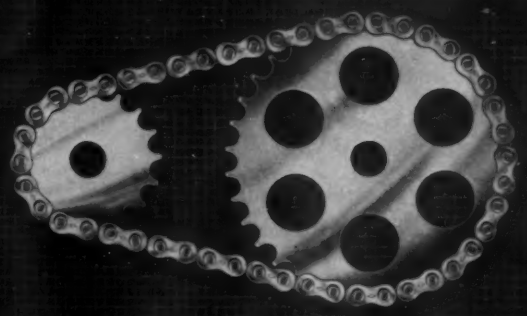
Engineers in the *Wheel Tractor Group, International Harvester* Co., Chicago, Ill., who solved this problem pointed out that surface finish of gear bore is very important. According to their experience, it should be held between 80-125 microin. rms. It is important that it not be smoother than this or the pressed-in bushing may turn in the bore. This can be a pitfall because production people may assume that anything smoother than specified is acceptable.

This design is used on the Model 55 Payscraper, a large earthmoving scraper. ▲▲▲

PLANETARY REDUCTION GEARING in the rear axle of this large earth-moving scraper was strengthened by using a steel-backed bronze bushing.



LIMITED SPACE inside rear wheel for planetary reduction gears made bearing change necessary.



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bushing-type chain | .1475" pitch

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and sub-miniature devices . . .

Precision-built of non-magnetic
Stainless Steel

SPECIFICATIONS

Pitch	.1475"
Overall Width	.210"
Weight per Foot (Approx.)	½ oz.
Chain length	+.051" to −.000/ft.
Operating Temp.	−65°F. to +400°F.
Tensile Strength	180 lbs. Average
Material	18-8 SS non-magnetic grade

Available also in ¼" Pitch, ASA No. 25 in stainless steel or standard steel.

SPROCKETS—Made to your specifications in regular or stainless steel, bronze, aluminum, nylon or other materials.

DIAMOND *Micropitch* is the first extremely fine pitch bushing chain (.1475") made especially for small-space applications such as cameras, computers, recorders, data processers and many other devices using miniaturized movements. It is ideal for power transmission, synchronization or conveying . . . and conforms to the same high standards of quality that have characterized all DIAMOND chains for more than 69 years.

You are invited to utilize DIAMOND'S *wealth of roller chain experience. Write for engineering recommendations for your project. Please supply complete details.*

ACTUAL SIZE

CONSTRUCTION FEATURES—Large joint bearing areas • High order press fits • Precise chain length control • Corrosion resistant, non-magnetic stainless steel.

ADAPTABILITY

Permits wide variety of shaft centers. • Multiple shaft drives can be accurately timed • Sprockets may engage both sides of chain • Connecting links easily assembled or disassembled without removing sprockets.

ACTUAL SIZE

CONVEYOR CHAIN

On special order, DIAMOND *Micropitch* chain can be supplied for small conveyors in elongated pitch construction and with special attachments.

DIAMOND CHAIN COMPANY, INC.
A Subsidiary of American Steel Foundries
Dept. 718 • 402 Kentucky Ave., Indianapolis 7, Indiana

Offices and Distributors in
All Principal Cities

DIAMOND ROLLER CHAINS ®

● *See DIAMOND Chain and Sprockets in action at*
DESIGN ENGINEERING SHOW
May 23-26, 1960 • Booth 424
New York Coliseum—N. Y., N. Y.

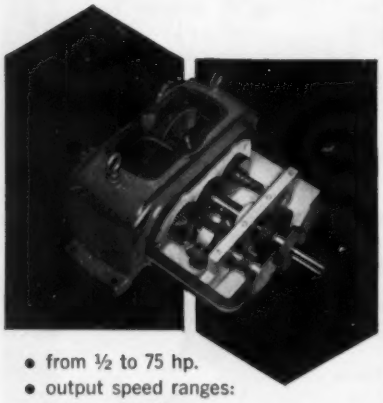
Circle No. 16 on Reader Service Card

Specify

SPECON for

VARIABLE SPEED DRIVES

electrical and mechanical



- from ½ to 75 hp.
- output speed ranges: 0-100 to 0-7000 rpm
- smoothly adjustable through zero speed
- draw accuracies of .01%
- full torque at zero speed

These are just some of the outstanding characteristics of Specon variable speed drives. Rugged, reliable and requiring minimum maintenance, they permit infinitely fine adjustment of output speed with accuracies approaching fixed gearing. Specon drives also feature shockless starts and acceleration, full reversing, and provide output speeds up to 7000 rpm while maintaining zero speed features.

Send for FREE data booklet on Specon variable speed drives.

STRATOS

A DIVISION OF FAIRCHILD ENGINE & AIRPLANE CORPORATION

INDUSTRIAL PRODUCTS BRANCH

#42, Route 109, West Babylon, N. Y.

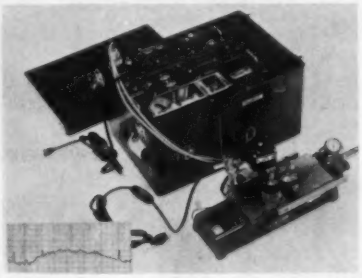
Circle No. 52 on Reader Service Card

NEW PRODUCTS

To get complete information on these products, use the Reader Service Cards bound into this issue.

Electronic gear tester

An electronic recorder is coupled with 2, 5, 9, and 15 in. gear testers.



Recorder can be calibrated to any ratio within the tape limits. Gear drive motor is wired to tape switch for gear and tape to work in unison. Gears can be checked in pairs or against a master gear.

Scherr-Tumico Co., New York, N. Y.

Circle No. 222 on Reader Service Card

Miniature rotary actuators

Actuators measure 1¾ x 2½ x 2 in., weigh approximately 12 oz. Six internal limit switches adjust travel from 10 degrees to 100 revolutions. Operating loads to 25 lb-in. Power is from 26 vdc motors or 115 v 400 cycle motors. Available in water- and oilproof casings.

Nash Controls, Inc., Newark, N. J.

Circle No. 223 on Reader Service Card

Multi-purpose oil

Anderol L-456 is a multi-purpose oil for gears, slides, bearings, and precision parts. Said to have good extreme pressure qualities, penetration and compatibility with ordinary lubricants, this medium-heavy diester oil has an overall temperature range of 40F to 350F.

Lehigh Chemical Co., Chestertown, Md.

Circle No. 224 on Reader Service Card

two sides to this coin

The ease of installation for the Conway Manual Clutch is a tradition. But "heads up" even this has been improved with the fabulous STATIONAIRE by Conway.

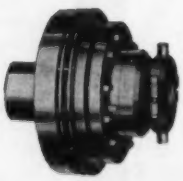
JUST DO THIS

here's why

Complete installation of STATIONAIRE requires but 4 extremely simple, labor-saving steps . . . practically no work at all:

1. **Attach to unit to be driven.**
2. **Slide clutch onto shaft.**
3. **Tighten set screw.**
4. **Hook up air line.**

YOU DON'T DO THIS



Save on these extra steps needed to install manually controlled clutches (as on our P25-A easy to install):

1. **Line up yoke.**
2. **Drill holes for fulcrum.**
3. **Mount fulcrum.**
4. **Mount yoke on shifter mechanism.**
5. **Connect yoke to fulcrum.**

Whether heads or tails, Conway does it better, faster and with tremendous savings.

WRITE FOR CATALOGS

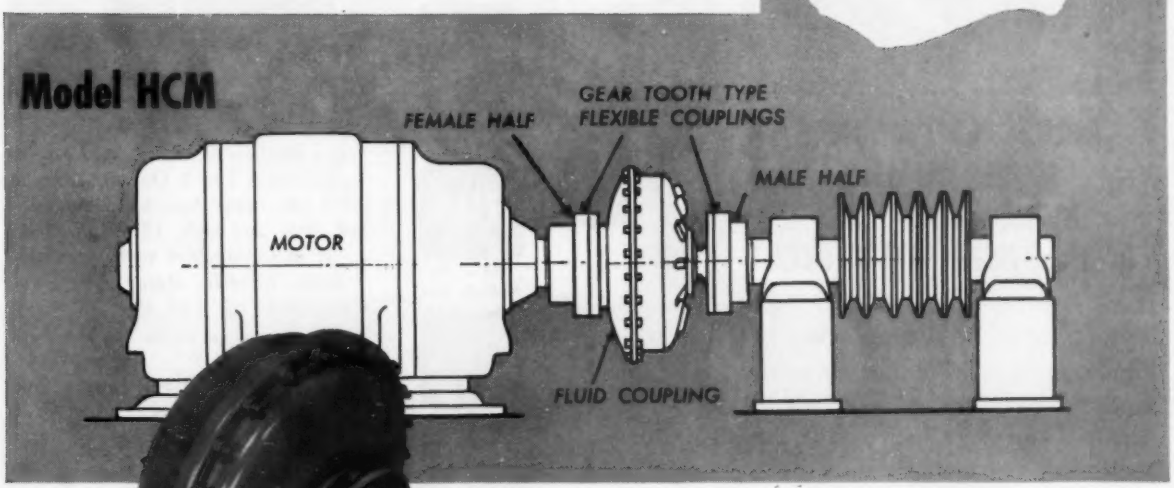
The CONWAY CLUTCH COMPANY

2754 COLERAIN AVE. **CINCINNATI 25, OHIO**

Circle No. 53 on Reader Service Card

MEMO to drive line designers:

Twin Disc Fluid Couplings give you all the benefits of fluid drive *PLUS* easy installation...



Twin Disc Fluid Coupling

Twin Disc HYDRO-SHEAVE® Drive

Working between engine or motor and driven equipment, Twin Disc Fluid Couplings provide performance benefits aplenty . . . benefits such as satin-smooth power flow, protection against shock loads, full transmission of input torque, and elimination of engine lugging and motor burnouts.

Here's another big advantage that's sometimes overlooked: Twin Disc Fluid Couplings are exceptionally easy to apply and install. They come in a wide variety of input-output combinations to match any hook-up requirement. A good example is the Model HCM coupling shown above.

Model HCM features an input flange and a flanged output shaft that connect between two halves of a gear-tooth type flexible coupling. The result is an extremely compact arrangement with minimum distance between driving and driven shafts (see diagram). Model HCM is available in nine sizes from 7.4S to 21 with capacities from ¾ to 500 hp.

A special integrated power transmission package is Twin Disc's HYDRO-SHEAVE® Drive. This low-cost conversion device has a tapered hub that permits the use of a wide range of quick-detachable V-belt sheaves. It can be installed in less than five minutes. Available for motors and engines in the ¾ to 50 hp range, the HYDRO-SHEAVE comes filled with hydraulic fluid and ready to install.

In all, Twin Disc offers design engineers a choice of ten fluid coupling models including a disconnecting-type and a fluid power take-off.

Write our Rockford office for Bulletin 144-D.

TWIN DISC

TWIN DISC

Friction Clutches and Fluid Drives

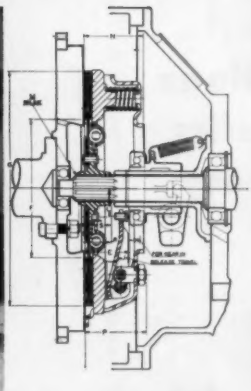
TWIN DISC CLUTCH COMPANY

Racine, Wisconsin

Hydraulic Division, Rockford, Illinois

Circle No. 34 on Reader Service Card

ROCKFORD



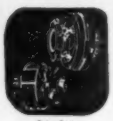
Small Spring Loaded

Automotive Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center


Light Over Center

Power Take-Offs

Speed Reducers

MORE PERFORMANCE
MORE QUALITY
MORE WORK LIFE
In this *NEW 'RT' CLUTCH*

Make more new customers—more profit—by featuring this NEW "RT" ROCKFORD CLUTCH. More performance—it is increased by smooth engagement of precision parts, no binding, grabbing or friction. More quality—it is increased by the patented features of the rolling fulcrum pin, and the precisely balanced throw-out levers. More work life—it is increased by the reduction of friction heat, precision workmanship and the application of advanced research on the clutch facings.

These improved features make the NEW ROCKFORD "RT" CLUTCH a valuable asset to the prime movers of yesterday, today and tomorrow. The NEW "RT" clutch is now being used in high horsepower commercial vehicles and tractors, where rugged stamina is needed. For more new customers and more profits, specify the NEW ROCKFORD "RT" CLUTCH.

SEND FOR THIS HANDY BULLETIN

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD Clutch Division BORG-WARNER

1331 Eighteenth Ave., Rockford, Ill., U.S.A.

Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

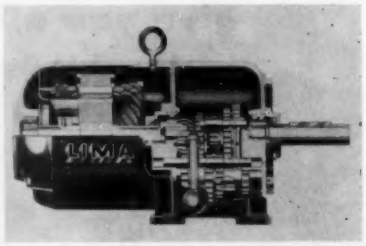
ROCKFORD B-W BORG-WARNER

CLUTCHES

Circle No. 51 on Reader Service Card

Selective speed drive

This 4 or 8 speed gearshift drive has hardened splines on the spline shaft, sintered bushings on the countershaft, and double width ball bearings on the output and motor shaft.



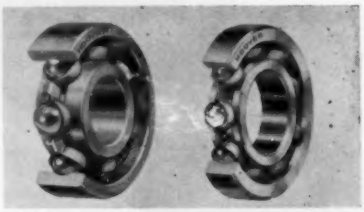
Single-speed motor speeds are 1800, 1200, or 900 rpm. Horsepower ratings are 1, 1½, 2, 3, and 5. Gear ratios are: low, 4.15 to 1; 2nd 3.15 to 1; and high, 1 to 1. Output speeds at 1800 rpm input: low, 420; 2nd, 555; 3rd, 930; and high, 1730 rpm. Two-speed motor doubles speed selection.

Lima Electric Motor Co., Inc., Lima, Ohio.

Circle No. 225 on Reader Service Card

Inch/metric ball bearings

One of two ball bearing series is to metric dimensions, with bore sizes from 4 to 9 mm. The other has inch



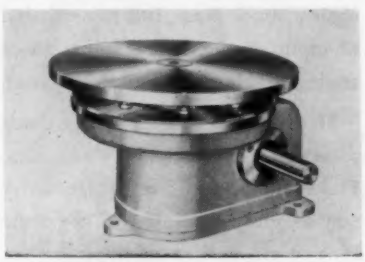
dimensions for bore, OD, and width. Shaft sizes for the inch series range from ⅛ to ½ in.

Hoover Ball & Bearing Co., Ann Arbor, Mich.

Circle No. 226 on Reader Service Card

Turret indexing unit

This miniature unit includes drive motor, reduction unit and main cam



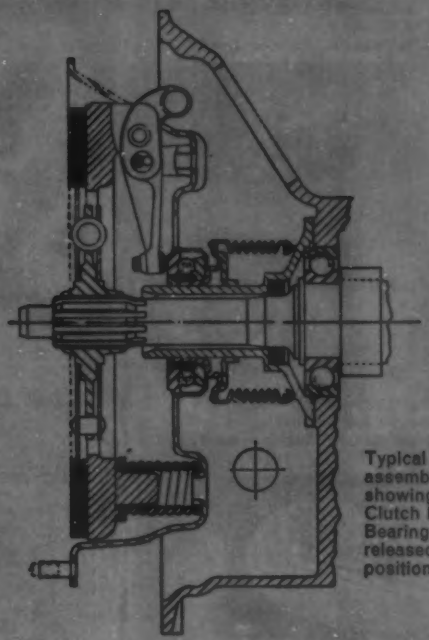
Aetna

CLUTCH RELEASE BEARINGS

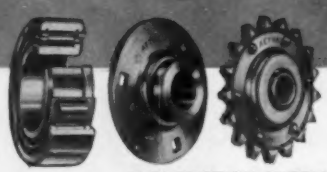
1,500,000 DE-CLUTCHINGS

Prove Longer Service Life— Silent Operation

Under every type of operating condition, Aetna Clutch Release Bearings have proved their dependability. Actual abusive breakdown tests of up to 1,500,000 de-clutchings have established Aetna's unmatched superiority in life expectancy; smooth, silent, trouble-free operation; and greater lubricant retention ability. It's no wonder then that over 50% of America's major producers of mobile vehicles specify Aetna Clutch Release Bearings as standard equipment. For complete information, call your local Aetna representative listed in your classified telephone directory, or write for General Catalog and Engineering Manual.



Typical clutch assembly showing Aetna Clutch Release Bearing in released position.



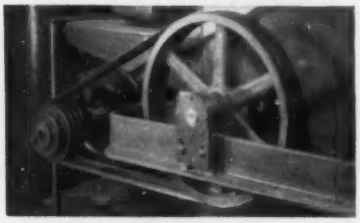
AETNA BALL AND ROLLER BEARING COMPANY
DIVISION OF PARKERSBURG-AETNA CORPORATION

4600 SCHUBERT AVE.
CHICAGO 39, ILL.

ANTI-FRICTION SUPPLIERS TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916

Circle No. 2 on Reader Service Card

WOOD'S POWER TRANSMISSION PRODUCT NEWS



NEW, NON-FREEZING VARIABLE

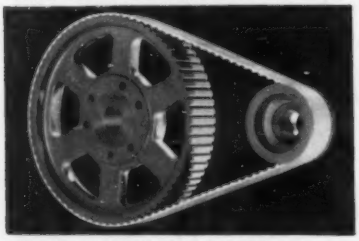
Wood's new "SVS" stationary control, variable speed drive has positive locking collars and other, patented features which eliminate freezing, assure easy speed change. No lubrication is required. Uses standard v-belts and stock companion sheaves. Write for Bulletin 6102.

Circle No. 38 on Reader Service Card

NEW, TREMENDOUS SAVINGS

Wood's new Ultra-V Drives handle up to 3 times more horsepower than conventional v-belt drives in a given space . . . reduce overall drive dimensions as much as 50% . . . cut weight up to 25% and costs up to 30%. Write for Bulletin 9102.

Circle No. 39 on Reader Service Card



POSITIVE ACTION—LONG LIFE

Wood's Timing Belt Drives provide positive, slip-free action. Belts are all muscle. No high initial tension, tension devices or lubrication needed. Drives are light weight, compact . . . quiet and clean. Wide load and speed range. Equipped with famous Sure-Grip Bushings. Write for Bulletin 2100.

Circle No. 40 on Reader Service Card

MP/360B

Woods

T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PENNSYLVANIA

ATLANTA • CAMBRIDGE • CHICAGO
CLEVELAND • DALLAS

shaft extension for mounting actuating cams. Turret diameter is 12 in. with eight work stations and an index-to-dwell relationship of 1:1. A hardened steel cross-over indexing cam provides cycloidal displacement. Flange or foot type mountings are available.

Swanson-Erie Corp., Erie, Pa.

Circle No. 227 on Reader Service Card

Bonded film lubricant

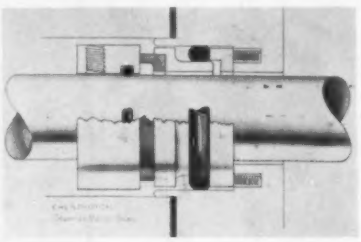
A film lubricant is applied to metals, glass, or plastic by spraying, dipping, or brushing without preheating. It's said to be permanently effective when dried at room temperatures. Baking at moderate temperatures increases solvent resistance. Flexing does not affect adhesion.

Poly Chem, Indianapolis, Ind.

Circle No. 228 on Reader Service Card

Fluid pressure seal

Balanced fluid pressure replaces operational springs in a mechanical seal. Counterpoise springs keep the



carbon faces in contact when pump pressure falls below working level. Seal needs no shoulder or sleeve for high pressures.

A. W. Chesterton Co., Everett, Mass.

Circle No. 200 on Reader Service Card

Hydraulic motors

A line of angle-type motors for 3000 psi. pressures has volumetric efficiency of 96 to 98%. Motors work at temperatures from —65 F to 275 F and use "AN" approved hydraulic fluids. Pistons and cylinders are steel. A nonferrous spline coupling cuts down drive shaft fretting corrosion.

The Cornelius Co., Minneapolis, Minn.

Circle No. 201 on Reader Service Card

Tiny components

Sub-minature clutches and brakes have zero backlash, zero endplay and no slip rings. Clutching and braking

take place without angular displacement or axial motion. Input and output shafts are concentric with the servo mounting pilot within .0015. Bearings are shielded where exposed. Current is approximately 1.2 watts at 24 vdc.

Guidance Control Corp., Hicksville, N. Y.

Circle No. 202 on Reader Service Card

Magnetic sequence switch

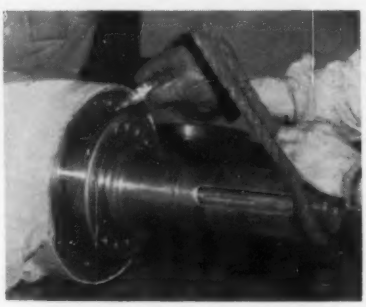
Hermetically-sealed, 3 pole, 4 position switches have a cycle rate of up to 10 pulses per second and a service life of over 100,000 cycles. They operate in temperatures from —65 F to 280 F. They are vibration proof to 10 G's at 500 cycles. Switches measure 5.80 in. long by 2.50 in. diameter. Weight is 26 oz.

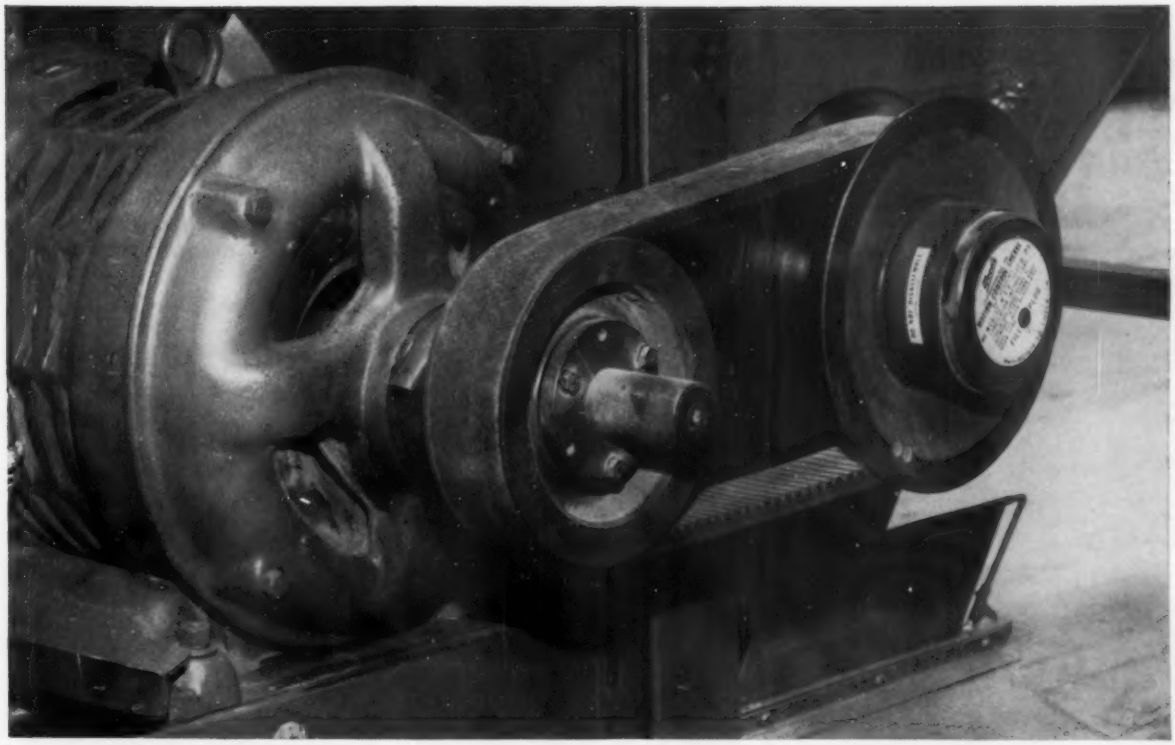
Ryan Industries Div., Lundy Mfg. Corp., Long Island, N. Y.

Circle No. 203 on Reader Service Card

Liquid bearing sealant

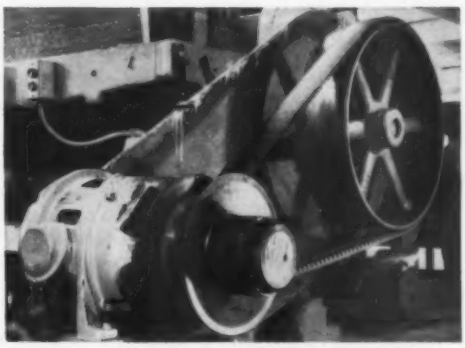
A plastic sealant hardens when confined between metal parts, and needs no mixing or heat. Catalytic action of the metal surfaces of bearing and housing hardens sealant into an oil- and heat-resistant bond. Sealant





New, revolutionary "MCS" sheaves won't freeze, hold constant speeds

Wood's "MCS" motion control, variable speed sheave is entirely new and revolutionary in concept. It holds constant driven speeds under varying torque loads. And, like Wood's recently introduced "MS" sheave, the "MCS" won't freeze or stick. Practically no maintenance is required. No more downtime, running through the speed range or dismantling. The oil reservoir requires checking only once or twice a year. These amazing advantages are made possible by Wood's exclusive, resilient cam follower construction and rotational oil pumping action. Investigate these and many other features. Write for Bulletins 8102 and 4101.



Wood's "MS" variable speed sheave is similar in basic operating principle to the "MCS." Power is transmitted through resilient keys which are externally located, permitting unobstructed lubrication, elimination of freezing and sticking.

Woods

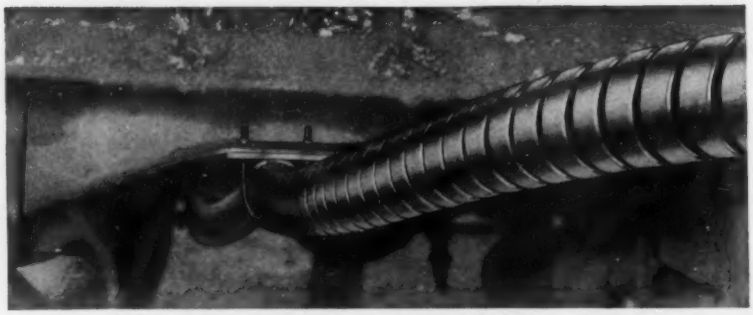
T. B. WOOD'S SONS COMPANY • CHAMBERSBURG, PENNSYLVANIA

ATLANTA • CAMBRIDGE • CHICAGO • CLEVELAND • DALLAS

MCS/160

Circle No. 37 on Reader Service Card

STOW FLEXIBLE SHAFTING
The Ideal PTO Drive



1¼" flexible shaft under tractor-trailer transmitting 10 HP.

1¼" core assembly pulled out of casing. Note steel-backed bronze sleeve bearing.

Here are five big reasons why flexible shafting is an ideal power take-off drive on trucks and tractor trailers.

FLEXIBLE SHAFTING:

1. Can connect a drive shaft and a driven shaft which are working at different angles and located in different planes.
2. Eliminates the need for accurate alignment.
3. Eliminates dangerously exposed revolving parts; no safety guards required.
4. Replaces connections affected by vibration.
5. Is economical because it is so easy to install and maintain.

Available with built-in bearings and couplings in sizes from ¼ inch to 1¼ inches in diameter—STOW flexible shafting can help solve your trucking and maintenance problems *in advance*. The know-how of 82 years experience goes into every STOW flexible shaft!

STOW flexible shafts are being used on trucks and tractor-trailers to:

- Operate pumps for petroleum, other liquids and hydraulic pumps on dump trailers.
- Operate conveyors for grain and coal.
- Operate compressors on refrigeration trucks.

Our Engineering Department will be glad to work with you on any special drive problems. For complete data on flexible shafting sizes, torque capacities, and other specifications, write for STOW Engineering Bulletin, No. 570, and Tractor-Trailer Bulletin, No. 542.

STOW

STOW MANUFACTURING CO.

440 Shear St. Binghamton, New York

Circle No. 33 on Reader Service Card

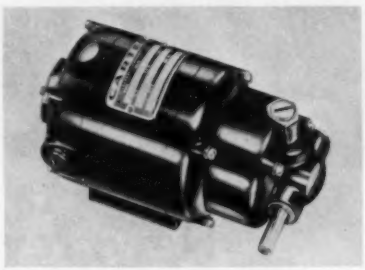
hardens by polymerization, not evaporation, so joint does not shrink. Other uses are to lock nuts and bolts, seal threaded and sleeve joints against high pressure fluids, and to mount bushings without a press fit.

American Sealants Co., Hartford, Conn.

Circle No. 204 on Reader Service Card

Gearmotors

The first worm is cut directly on the shaft in these gearmotors. Ten standard single and double worm reduction models are available, with shaft outputs of 10-750 rpm. Shaft worm and secondary worms are case hardened. A fibre high speed first gear



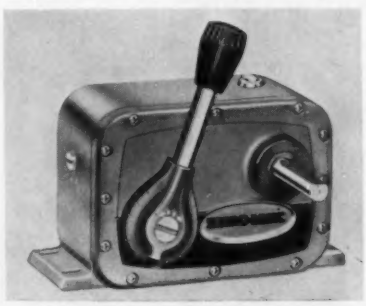
cuts down noise and the low speed gear is bronze for maximum torque. Shaft position is changed to six 30-degree positions by screws. Motor shafts run on ball bearings, gear shafts on bronze sleeve bearings. Overall size is 6 x 3 5/16 x 3 3/8 in. high, weight about 5 lb. Universal, shunt or series motors from 12v. to 220v. input.

Carter Motor Co., Chicago, Ill.

Circle No. 205 on Reader Service Card

Variable speed drives

The "400" series of over 250 models is a complete redesign of the Zero-Max line. Principal improvements are built-in overload protection and a control for fast and precise speed setting. Other features include a



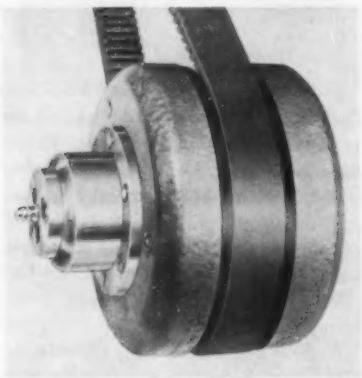
larger input shaft on smaller models for easier adaptation of pulleys, up to 40 percent decrease in heat rise over ambient, improved gasketing and oil seals. Output range is from 0 to 1200 rpm with 1800 rpm input. Torques are constant from 3 to 450 in. lb. Lever, screw, vernier, or remote controls are available. Drives are supplied with or without fractional hp motors from 1/8 to 3/4 hp and with or without reverse or gearhead. Lubricant comes with each unit.

Zero-Max Co., Minneapolis, Minn.

Circle No. 206 on Reader Service Card

Cam-operated pulleys

A line of cam operated pulleys uses narrow V-belts and has adjustable motor bases. Pulleys give ratios of 3 to 1, are rated for 1, 1½, 2, 3, and 5 hp motors at 1750 rpm, and for ¾ to 3¼ hp motors at 1150 rpm.



V-belts are from 7/8 to 1 7/16 in. top widths, Bore sizes are 5/8, 3/4, 7/8, 1 and 1 1/16 in. with bore lengths from 2½ to 3⅝ in. and motor travel for full speed range 3⅛ to 4 in. Are said to have constant speed, avoid belt compression, and to tension belt to load.

Hi-Lo Mfg. Co., Chicago, Ill.

Circle No. 207 on Reader Service Card

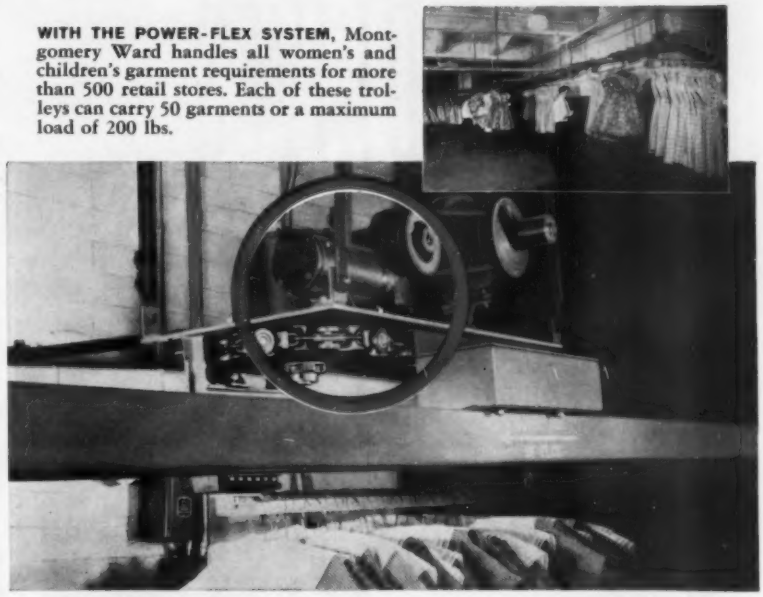
Brake motors

Motor and brake are a one-piece unit in this line of fractional hp, three-phase, ac brake motors. Endshield of the motor serves as endshield of the brake. The brake is spring set, solenoid released and sets automatically if power fails. Brake torque is 3 lb-ft continuous. Brake coil windings are single phase. Construction is drip-proof or totally enclosed and fan-cooled. Sizes range from ¼ through

a CM Power-Flex Conveyor
using a WINSMITH Speed Reducer

"DELIVERS THE GOODS"
FOR MONTGOMERY WARD

WITH THE POWER-FLEX SYSTEM, Montgomery Ward handles all women's and children's garment requirements for more than 500 retail stores. Each of these trolleys can carry 50 garments or a maximum load of 200 lbs.



A CLOSEUP of the Winsmith Model 5 CVD Speed Reducer used to drive the CM Power-Flex Conveyor which features Telematic Dispatch Control. Chain Speed is 40 ft/min.

MONTGOMERY WARD'S DISTRIBUTION CENTER on Varick Street in New York City, is built around a Columbus McKinnon Power-Flex Conveyor System equipped with a Winsmith Speed Reducer. CM's Power-Flex is a power and free system that, in this application, handles as many as 38,000 women's and children's garments in a single 8-hour day. Its advanced design and construction features permitted savings of 50,000 sq. ft. of floor space and untold dollars in operating economies.

COLUMBUS McKINNON specifies Winsmith Speed Reducers for their Power-Flex Systems because high output efficiency, compactness, long service life, minimum maintenance and low initial cost are prime factors.

FOR EVERY APPLICATION from 1/100 to 85 H.P. — in ratios from 1.1:1 through 50,000:1 — investigate the advantages of standardizing on Winsmith Speed Reducers for your products.

WINSMITH SPEED REDUCERS

WRITE TODAY... for complete selection information and engineering data.

WINSMITH, INC.
28 Sixth Street, Springville, (Erie County), N. Y.

Circle No. 36 on Reader Service Card

AVAILABLE FROM LOCAL STOCK

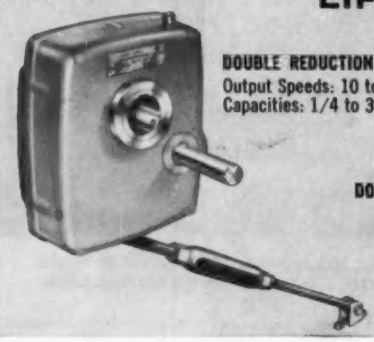
FOOTE BROS. SHAFT MOUNTED DRIVES

WITH

Duti-Rated®

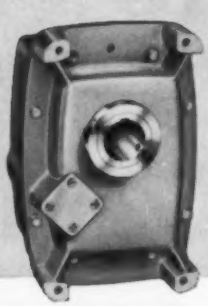
LIFETIME GEARING*

SINGLE REDUCTION
Output Speeds: 90 to 420 RPM
Capacities: 1/4 to 40 HP



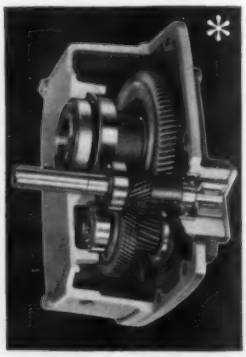
DOUBLE REDUCTION
Output Speeds: 10 to 160 RPM
Capacities: 1/4 to 30 HP

DOUBLE REDUCTION FLANGE MOUNT
Output Speeds: 10 to 135 RPM
Capacities: 1 to 7 HP



Foote Bros. Shaft Mounted Drives offer more efficient, more economical, power transmission. They incorporate exclusive Duti-Rated Lifetime Gearing — the high hardness, balanced design, premium quality gearing that combines greater load carrying capacity with long service life.

Used with standard V-Belts and Sheaves, Foote Bros. Shaft Mounted Drives will provide virtually any output speed you may require. Quick, easy installation on driven shafts with diameters from 15/16" to 3-7/16" saves time, labor . . . eliminates need for reducer mounting, couplings, and adjustable motor mount. Built-in Backstop to prevent reverse rotation, Automatic Overload Release Torque Arm, Variable Pulley, are available as optional equipment.



The complete Foote Bros. Shaft Mounted Drive line is made in accordance with all applicable AGMA Standards

Write for NEW SHAFT MOUNTED DRIVE CATALOG

FOOTE BROS. GEAR AND MACHINE CORPORATION
4575 South Western Boulevard, Chicago 9, Illinois

POWER TRANSMISSION DRIVES

Circle No. 43 on Reader Service Card

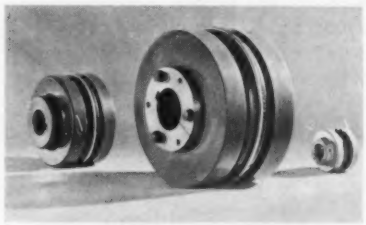
¾ hp. All models are rated 208-220/440, 550v. 1725/1425 rpm. The ½ hp model is also available in 1140/950 rpm. Dripproof model is rated 60/50 cycle, 40/50 C rise. Totally enclosed, fan-cooled model is rated 55 C rise.

General Electric Co., Schenectady, N. Y.

Circle No. 208 on Reader Service Card

Zinc alloy couplings

Couplings use zinc alloy flanges with tensile strength of 41,000 psi. A molded flexible rubber sleeve locks into the teeth of the flanges, tightening under torque for transmission.



There is no metal contact, therefore no wear on the flange teeth. Three stock bore sizes are ⅜ to ¾ in., ½ to 1 in., ⅝ to 1⅛ in. Peak hp ratings at 1750 rpm are: 1.5, 3, and 6 hp. An addition to the standard range is rated at 500 peak hp at 1750 rpm for shaft sizes from 1 in. through 3-15/16 in.

T. B. Wood's Sons Co., Chambersburg, Pa.

Circle No. 209 on Reader Service Card

Spring-tension bushes

Tubular, hardened spring-steel bushes for oscillating or low rpm bearings.

Spring tension holds the bush in place, and machine-chamfered ends permit quick insertion. Has center lubrication by slots.

John Gillen Co., Cicero, Ill.

Circle No. 210 on Reader Service Card

Azimuth drive motor

Three-phase, 400 cycle, 200v. ac azimuth drive motor is 1/10 hp.

Motor speed of 11,000 rpm is geared down to 290 rpm continuous duty operation. Size is 2 in. diameter by 4 in. long.

Electro Products Div., Western Gear Corp., Pasadena, Calif.

Circle No. 211 on Reader Service Card

Drive tensioner

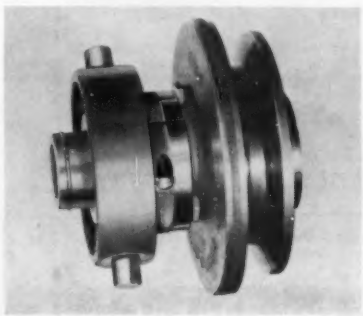
Practical and inexpensive drive tensioner takes up slack in chain and belt drives, and also can be used as an idler bracket. It uses a rotating arm and adjusting slot which permits vertical and horizontal positioning through 360°. The rotating arm has a serrated mounting pad which mates with a serrated mounting pad of the base. The rotating arm is bolted in position. Loosening and tightening a bolt in the adjusting slot of the base gives fine scale adjustment.

Brewer Machine & Gear Co., St. Louis, Mo.

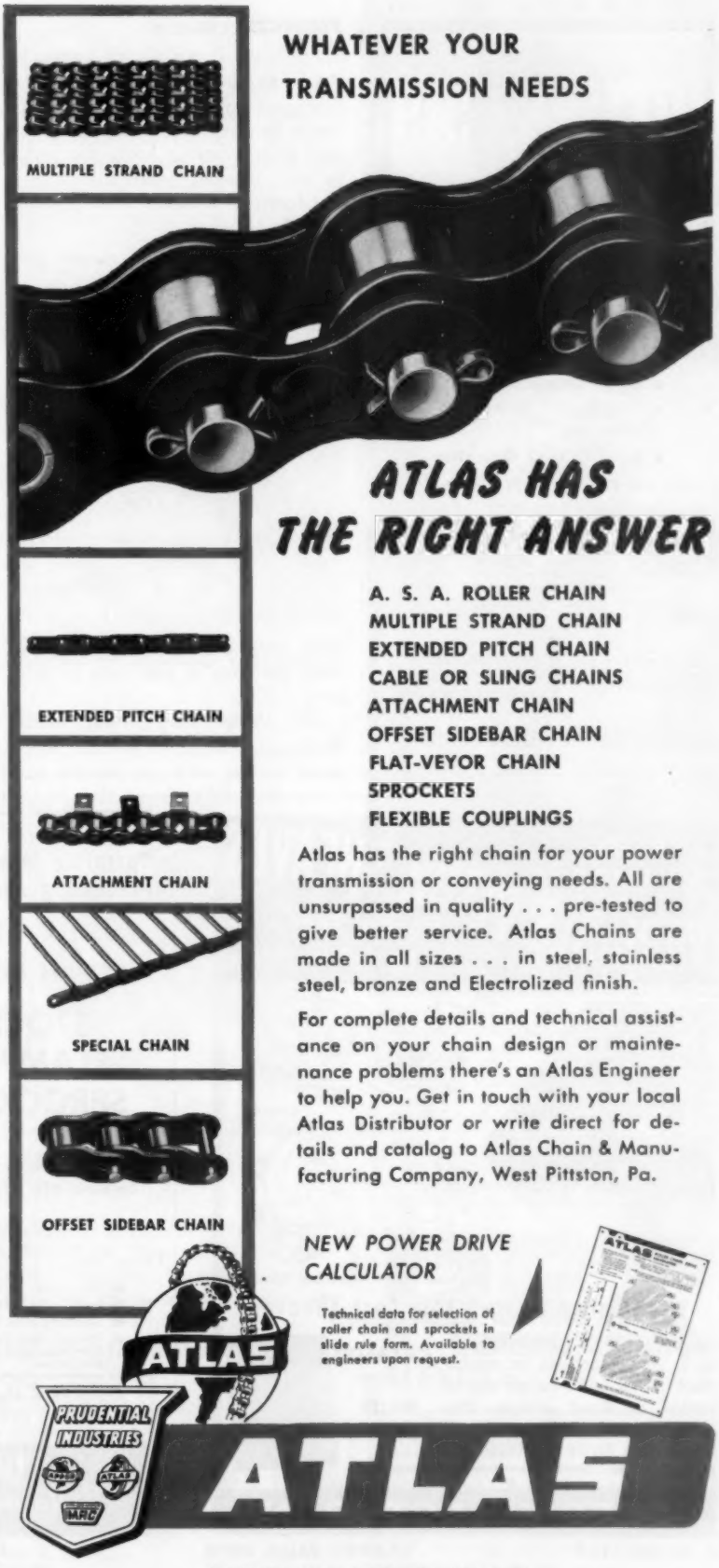
Circle No. 212 on Reader Service Card

Disc clutches

Two types of disc clutch are for heavy service on keyed stub or through shafts from 5/8 in. to 1¼ in. at speeds to 4000 rpm. Single or

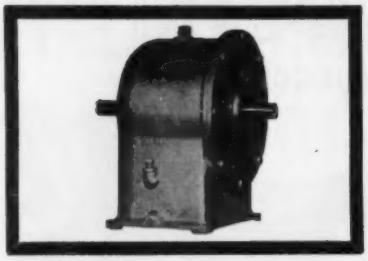


double V-belt sheaves mounted on double seal ball bearings use A and B belts with pitch diameters from


MULTIPLE STRAND CHAIN
EXTENDED PITCH CHAIN
ATTACHMENT CHAIN
SPECIAL CHAIN
OFFSET SIDEBAR CHAIN
WHATEVER YOUR TRANSMISSION NEEDS
ATLAS HAS THE RIGHT ANSWER
A. S. A. ROLLER CHAIN
MULTIPLE STRAND CHAIN
EXTENDED PITCH CHAIN
CABLE OR SLING CHAINS
ATTACHMENT CHAIN
OFFSET SIDEBAR CHAIN
FLAT-VEYOR CHAIN
SPROCKETS
FLEXIBLE COUPLINGS
Atlas has the right chain for your power transmission or conveying needs. All are unsurpassed in quality . . . pre-tested to give better service. Atlas Chains are made in all sizes . . . in steel, stainless steel, bronze and Electrolized finish.
For complete details and technical assistance on your chain design or maintenance problems there's an Atlas Engineer to help you. Get in touch with your local Atlas Distributor or write direct for details and catalog to Atlas Chain & Manufacturing Company, West Pittston, Pa.
NEW POWER DRIVE CALCULATOR
Technical data for selection of roller chain and sprockets in slide rule form. Available to engineers upon request.
ATLAS
PRUDENTIAL INDUSTRIES
ATLAS

Circle No. 3 on Reader Service Card

Circle No. 5 on Reader Service Card



Fluo-Matic

TORQUE MULTIPLIER

- **Stops Overload Stalling**
- **"No-Shock" Starting & Stopping**
- **Smooth, Easy Operation**

with gas engines ½ to 10 hp.

FLUO-MATIC TORQUE MULTIPLIER is engineered for low horsepower drive requirements —gives the easy operation, smooth power flow, and surging acceleration of modern torque converter drives. Available as a self-contained package unit consisting of a turbine, reaction member and pump in an aluminum housing, or custom units made to specifications.

Write Dept. T-4 For Free Booklet

Specify Application, Engine, Output Drive, Operating Conditions

AUTOMATION INDUSTRIES, INCORPORATED
1121 ST. CLAIR AVE. • CLEVELAND 14, OHIO

PRODUCTS *continued*

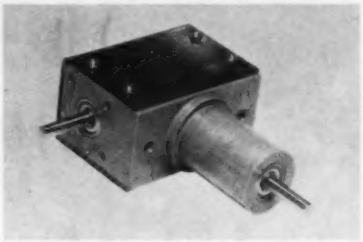
3.4 in. to 4.6 in. Clutches engage and disengage by hand lever. One type has a bronze shifter for less severe use. A cam action holds the clutch in the engaged position.

Edgemont Machine Co., Dayton, Ohio.

Circle No. 213 on Reader Service Card

Miniature gear boxes

Right-angle miter gear boxes are ⅞ x 1 ½ x 2 in. Made of stainless



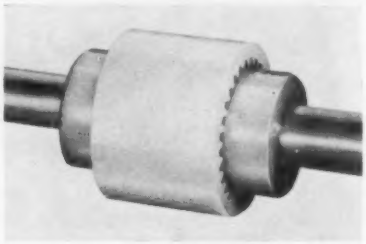
steel, with aluminum frame. Minimum backlash is less than 10 minutes.

PIC Design Corp., Long Island, N. Y.

Circle No. 214 on Reader Service Card

Nylon gear coupling

Designed for direct drives with small integral hp and fractional hp motors, coupling has hubs and sleeves of nylon. It needs no lubrication. Hubs



are bored for shaft sizes of ⅜ in., ½ in., and ¾ in. They are locked on with 2 set screws. Overall length is 2 9/32 in., sleeve length of 1 15/16 in.

Waldron-Hartig Div., Midland-Ross Corp., New Brunswick, N. J.

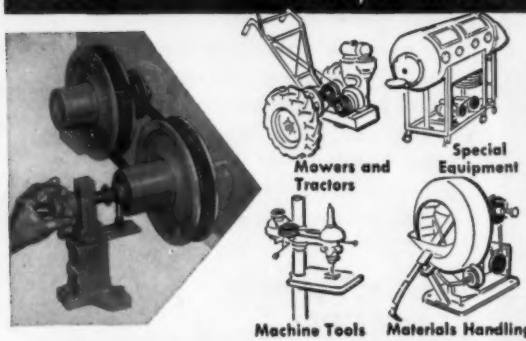
Circle No. 215 on Reader Service Card

Immersible actuator

Motor-driven actuator develops 100 in.-lb of starting torque, with a nominal running torque of 25 in.-lb. Designed to operate a ball valve submerged in gasolene, it is housed in

SPEED SELECTOR VARIABLE PITCH SHEAVES

Control Speeds on Variety of Machines



Wide Speed Range! Low Cost Sheaves

Speed Selector Sheaves can give your machines or equipment extra wide-range speed control on fixed centers. Efficient, rugged, simple to use — low in cost! Write for Illustrated Bulletin.

CATALOG FREE! WRITE TODAY

SPEED SELECTOR INC.

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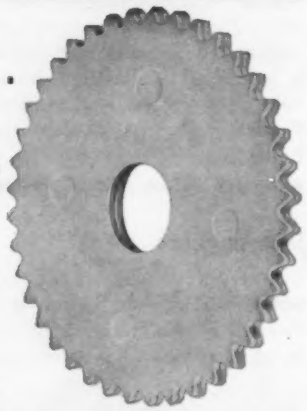
Circle No. 32 on Reader Service Card

Engineers Operating Men Purchasing Agents . . .

Save with DAYTON ROGERS

STOCK STAMPED SPROCKETS



76 Sizes— Immediate Delivery

IF you design, select or apply power transmission products for O.E.M. or in-plant use, consider these die-cut roller chain sprockets: they are priced far below comparable sprockets machined the conventional way.

- For A.S.A. No's. 35, 40 & 41 chains
- From many materials
- Stamping principles and stock tools permit many modifications
- Special sizes tooled and run at surprisingly low cost

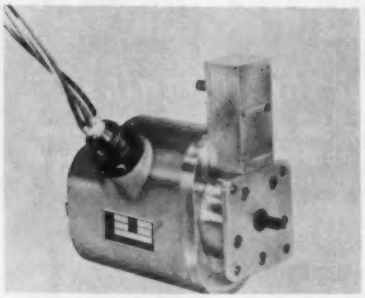
Test these sprockets in your applications. Write for specifications and prices.

ALSO: Photo-Mechanical Duplicating without the use of dies or stamping equipment. Write for details.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7Z, MINNESOTA

Circle No. 13 on Reader Service Card



an aluminum alloy case which will withstand 20 psi pressure. An optional over-ride device permits operation with a wrench if power fails. The actuator shaft rotates 90 ± 1½ degrees and uses a Geneva movement for accurate positioning. Works on 115v. ac, 400 cps, is 5 in. long, weighs 2.6 lb.

Globe Industries, Inc., Dayton, Ohio.

Circle No. 216 on Reader Service Card

Stroboscopic discs

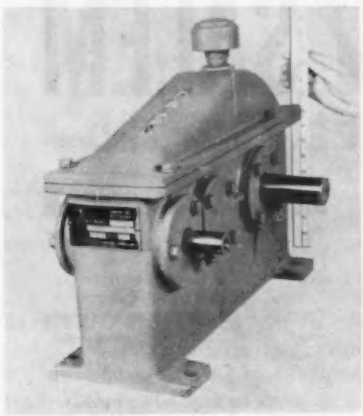
With these instruments, tape speeds from 1⅞ to 60 ips can be measured. In addition to the standard 7½, 15 and 30 ips TapeStrobe Model A, a standard 3¾, 7½ and 15 ips Model B is available. A step down adaptor adds 3¾ ips to Model A and 1⅞ ips to Model B.

Scott Instrument Labs., New York, N. Y.

Circle No. 217 on Reader Service Card

Compact speed reducer

Helical geared, parallel shaft speed reducer, is rated at 3.9 hp with 1750



rpm input and 30:1 ratio. Overall height is 15 ⅛ in.

Alten Foundry & Machine Works, Inc., Lancaster, Ohio.

Circle No. 218 on Reader Service Card

Packaged retaining rings

Most sizes of Truarc retainings rings are available in snap fastener envelopes. Rings of 118 sizes are offered for shafts and housings from .062 to 2.0 in. diameter. To prevent

corrosion, only cadmium plated and beryllium copper rings are packed this way. Dimensions of the envelopes are 3½ x 4 in.

Waldes Kohinoor, Inc., Long Island, N. Y.

Circle No. 219 on Reader Service Card

Internal-expanding brake

A 4-in. internal expanding brake can be welded directly to sprockets with weld nuts. It has steel housing, actu-

ator plate and hub, cadmium dichromated for rust prevention. Bore sizes are ¾ in., 1 in., and 1⅛ in. with the standard 2-in. hole on brake drum for right or left hand wheel.

Automatic Steel Products, Mercury Clutch Div., Canton, Ohio.

Circle No. 220 on Reader Service Card

Rheostat footswitch

The variable resistor of a rheostat footswitch has a maximum resistance of 350 ohms with the unit rated at 8 amps at 125v. ac or dc. Supplied with a 6-ft cord set, with a 2-prong series plug.

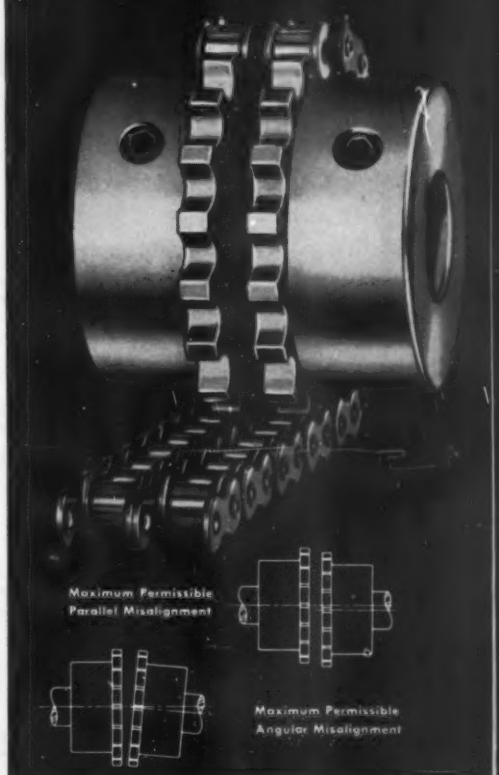
Linemaster Switch Corp., Woodstock, Conn.

Circle No. 221 on Reader Service Card

Circle No. 48 on Reader Service Card →

Another PLUS value...

PROTECTION AGAINST MISALIGNMENT



For positive protection against unavoidable misalignments...for positive power transmission...for high strength and long life...at low cost, use all-steel Rex Roller Chain Flexible Couplings. They compensate for both angular and parallel misalignment... absorb shocks and vibration...provide maximum flexibility with minimum backlash. For complete, cost-saving facts...compare! See your Rex Distributor or mail the coupon.

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FLEXIBLE COUPLINGS

CHAIN Belt Company 413 B
4734 W. Greenfield Ave.
Milwaukee 1, Wis.
(In Canada: CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto, Ontario.)
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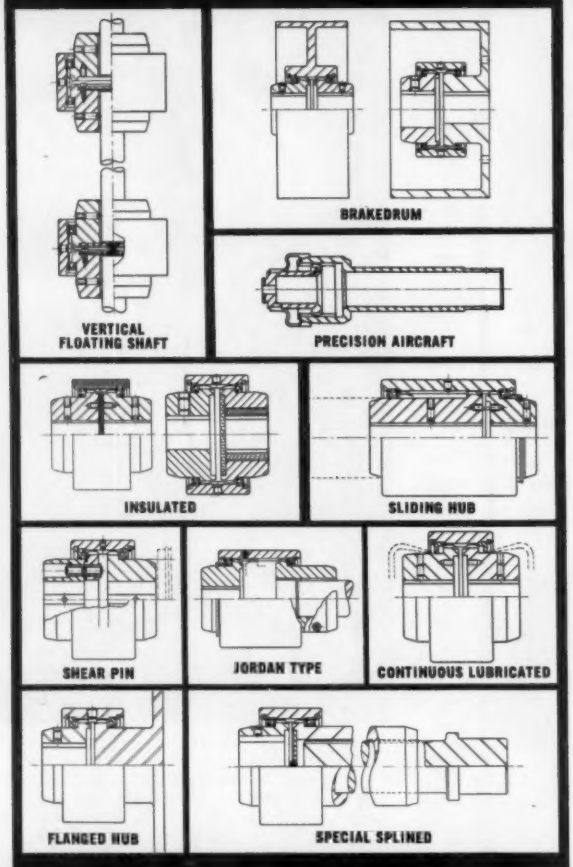
IN FLEXIBLE GEAR COUPLINGS...

Sier-Bath is a specialist in "specials"



More than 50 years of precision gear experience is in the design and manufacture of every special coupling. Some of the typical special designs shown above are adapted from the basic, proven Standard Flexible Gear Coupling. If you have a particular coupling design problem, contact Sier-Bath for immediate, expert assistance.

For complete information on the Sier-Bath Flexible Gear Coupling line, send for Catalog C-5 and Bulletin N-1.

Member A.G.M.A.
Founded 1905

Sier-Bath
GEAR AND PUMP CO., INC.
FLEXIBLE COUPLING DIVISION
9252 HUDSON BLVD., NORTH BERGEN, N. J.

Circle No. 30 on Reader Service Card

Circle No. 4 on Reader Service Card

WHAT'S YOUR PROBLEM?

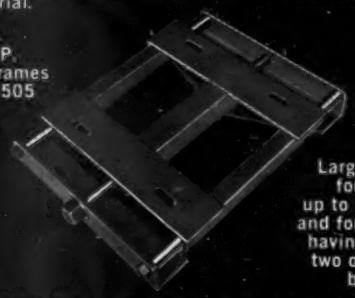
Is it any of the following?

- Diminishing output due to a progressive drop in rpm.
- Too much down-time because of the need for frequent adjustment due to belt stretch.
- Excessive maintenance time and expense.
- Poor belt and bearing life.
- A drive in an inaccessible or isolated location.
- A high-ratio short-center drive.

MOUNTING THE MOTOR ON AN "AUTOMATIC"® BASE MAY PROVE TO BE A SIMPLE AND ECONOMICAL SOLUTION

Motor mounting position and direction of pulley rotation are immaterial.

Stock Sizes
¼ to 125 HP.
for NEMA frames
56 through 505
and 445-U



Larger Sizes for motors up to 500 HP. and for motors having one or two outboard bearings.

AUTOMATIC MOTOR BASE CO.
WINDSOR, N. J.

Specify Strong Smooth Safe SALEM

COPPER BRAZED

FORMED STEEL PULLEYS

for your power transmission

Engineered for Lawn Mowers, Garden Tractors, Compressors, Agricultural and Industrial Equipment. Smooth rolled edges reduce belt wear. Solid steel discs and hubs weather heavy loads and high speeds.

Write for Engineering booklet to help you specify your Pulley requirements.

SALEM STAMPING & MFG. CO., INC.
DEPT. 16 SALEM, OHIO

Circle No. 29 on Reader Service Card

LITERATURE on drives and components

To get free copies of the following literature, use the Reader Service Cards bound into this issue.

FACILITIES BROCHURE . . . describes potential for design and production of electronic and electromechanical devices, and lists products now available. *Lear, Inc.*, Grand Rapids, Mich.

Circle No. 300 on Reader Service Card

TORQUE RATINGS . . . for continuous tooth herringbone gear speed reducers are tabulated in a supplement to Catalog No. 40-E. Forced feed lubrication also is discussed. *D. O. James Gear Mfg. Co.*, Chicago, Ill.

Circle No. 301 on Reader Service Card

COUPLINGS . . . are covered in Bulletin No. 5103. Data is also given on spacer couplings and on connecting shafts by couplings and floater shaft. *T. B. Wood's Sons Co.*, Chambersburg, Pa.

Circle No. 302 on Reader Service Card

CENTRALIZED LUBRICATION . . . system components and principles are discussed in Bulletin No. 26-T. Illustrations of typical applications are shown. *Eaton Mfg. Co., Farval Div.*, Cleveland, Ohio.

Circle No. 303 on Reader Service Card

FLEXIBLE COUPLINGS . . . Catalog No. 60 contains diagrams and tables for each type of coupling. Misalignment, dynamic balancing, and bore and keyway standards are also covered. *Thomas Flexible Coupling Co.*, Warren, Pa.

Circle No. 304 on Reader Service Card

ELECTRIC MOTORS . . . of 16 different kinds in frame sizes 48 through 56, are shown in 12-page Bulletin GEA-6424 A. Capacitor-start, split-phase, permanent split capacitor, shaded pole, and polyphase motors are included. *General Electric Co.*, Schenectady, N. Y.

Circle No. 305 on Reader Service Card

ALUMINUM BEARING BARS . . . how they are machined, and list sizes are described in a 10-page booklet. Aluminum is said to have good anti-scoring properties which lengthens bearing life. *Bunting Brass & Bronze Co.*, Toledo, Ohio.

Circle No. 306 on Reader Service Card

BRONZE ALLOY . . . specifications are compiled in a 4-page brochure. A chart shows compressive strengths of selected alloys. *Renewal Services Inc.*, Philadelphia, Pa.

Circle No. 307 on Reader Service Card

CHAIN AND SPROCKETS . . . to meet nearly all roller chain needs are detailed in 56-page Bulletin A691. Selection data and price lists are included. *Dodge Mfg. Corp.*, Mishawaka, Ind.

Circle No. 308 on Reader Service Card

SPEED CONTROL . . . of fractional hp. motors is discussed in an article in *Bodine Motorgram. Bodine Electric Co.*, Chicago, Ill.

Circle No. 309 on Reader Service Card

AUTOMATIC DRIVES . . . A centrifugal driving clutch engages at a predetermined engine speed and disengages upon deceleration. This brochure includes details of automatic clutches. *Salsbury Corp.*, Los Angeles, Calif.

Circle No. 310 on Reader Service Card

LINEAR AND ROTARY ACTUATORS . . . in 20 sizes, giving torques from a few in.-oz. to 3500 in.-lb, are detailed in 16-page Bulletin J-105. Motor specifications are shown. *Jordan Controls, Inc.*, Milwauke, Wis.

Circle No. 311 on Reader Service Card

FLANGE BLOCKS . . . for tapered roller bearings are described in Catalog BU-103 A, together with pillow

Circle No. 49 on Reader Service Card ⟶

Another PLUS value...

ECONOMICAL CONVEYING

Where maximum economy in roller chain conveyors is required, investigate the advantages of Rex Double-Pitch Roller Chains. These chains are built to the same high standards of quality and strength as standard Rex Roller Chains but offer important economy advantages because of their design. Each length of double-pitch chain has only *half* the number of parts of an equivalent-length standard roller chain. It costs less...it weighs less. For all the facts, mail the coupon.

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ROLLER CHAINS

CHAIN Belt Company 406
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Milwaukee 1, Wis.
(In Canada: CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto, Ontario.)

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City.....*Zone*....*State*.....

LITERATURE *continued*

blocks and take-up frames. Blocks have shaft sizes of 1 3/16 through 2 15/16 and are equipped with eccentric locking collars, malleable housings and grease seals. *Browning Mfg. Co.*, Maysville, Ky.

Circle No. 312 on Reader Service Card

MOTOR REDUCER . . . selection guide describes construction and mechanical features of motor reducers in eight housing sizes for applications up to 125 hp and output speeds of 9 rpm to 420 rpm. Load characteristics are outlined, including horsepower and torque ratings, overhung loads and maximum allowable thrust loads. This Catalog MR-58 has 28 pages. *Philadelphia Gear Corp.*, Philadelphia, Pa.

Circle No. 313 on Reader Service Card

BALLMOUNTS . . . are said to reduce vibration and are easy to install. Bulletin 59.04.6 gives data. *Barry Controls Inc.*, Watertown, Mass.

Circle No. 314 on Reader Service Card

D-C MOTORS . . . in ratings of 1/20 to 1 hp at 3450 to 860 rpm are described in a 2-page bulletin. Motors are open or totally enclosed. Frame and overall dimensions are included. *General Electric Co.*, Schenectady, N. Y.

Circle No. 315 on Reader Service Card

LIQUID METAL SEALANT . . . how it is made, and its uses for fixing bearings, locking nuts, and sealing pipes are described in an 8-page brochure. *American Sealants Co.*, Hartford, Conn.

Circle No. 316 on Reader Service Card

VARIABLE-SPEED SHEAVES . . . with resilient cam-follower design said to eliminate freezing and sticking are described in Bulletin No. 8102. Design also is said to hold a constant driven speed under varying torque loads. Construction is shown, and tables are included for selecting companion sheaves and belts to meet specified requirements. *T. B. Wood's Sons Co.*, Chambersburg, Pa.

Circle No. 317 on Reader Service Card

SPEED REDUCERS . . . specifications for 20 sizes of reducers are given in a 4-page folder. *Alten Foundry & Machine Works, Inc.*, Lancaster, Ohio

Circle No. 318 on Reader Service Card

SYNCHRONOUS MOTORS . . . have stator insulation of silicone rubber and sealed integrated field coils. Details in Bulletin 05B9522. *Allis-Chalmers Mfg. Co.*, Milwaukee, Wis.

Circle No. 319 on Reader Service Card

STOCK GEARS . . . of popular sizes are specified in 148-page Catalog 58. Facilities for making gears to customer specifications are included. *Globe Gear Co.*, Philadelphia, Pa.

Circle No. 320 on Reader Service Card

ELECTRIC MOTORS . . . with new NEMA frame sizes are illustrated in Bulletin AMC-1. Construction details, ratings, and possible applications are given. *Lima Electric Motor Co., Inc.*, Lima, Ohio

Circle No. 321 on Reader Service Card

Couplings for Power Transmission

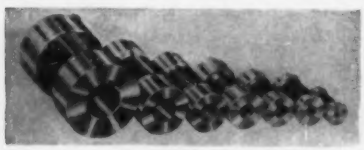
Gear-Grip . . .

The most revolutionary Flexible Coupling Design Development in a century!

Actual Size New 5-G Coupling

- Now available for subfractional, fractional and integral H. P.
- Ability of rubber Flex-Elements to float between captive end fittings distributing load similar to universal joint action.
- Load Ranges—1/12 H.P. through 30 H.P.
- Shaft Sizes—⅛ through 1⅞.
- Specified exact length to design requirements per series.
- Prevention of end thrust among many other design advancements.*

Dyna-Line The finest flexible coupling in single unit construction—specifically designed for fractional H.P.



- Lengths varied to design specifications in each series.

5R 4R 3R 2R 1R 0R 00R

- True Flexibility and Torsional Resilience for quiet, load-plus power transmission without extreme deflection or twist.
- Load ranges—1/15 to 1½ H.P.
- Shaft sizes—3/16" to ¾".
- Lowest O.D. for highest torque capacity.

Write for Catalogs and Technical Bulletins.

GUARDIAN PRODUCTS CORP. DEPT. PT-460 1215 E. SECOND ST. MICHIGAN CITY, IND.

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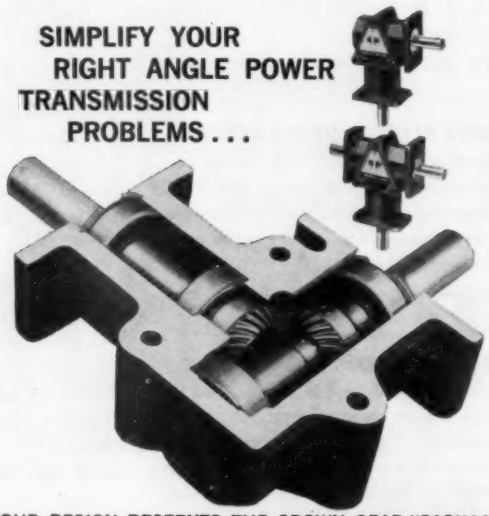

YOUR DESIGN DESERVES THE CROWN GEAR "PACKAGE".

- Totally enclosed Aluminum Alloy Housing
- 316 Stainless Steel Shafts • Double Sealed Ball Bearings • Hardened Steel, Spiral Bevel Gears
- Choice of 4 or 5 Mounting Positions • Ratings from ¼ through 2 H.P. • 1:1 or 2:1 Ratio optional

Contact your local distributor or write direct for new catalog . . .

CROWN GEAR

320 PARK AVE., WORCESTER 10, MASS.

A Division of Harrington & Richardson, Inc.

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STEEL CASTINGS . . . and their many uses are covered in a 28-page booklet. Line drawings of 200 typical castings are shown. *Steel Founders Society of America*, Cleveland, Ohio

Circle No. 322 on Reader Service Card

ELECTRIC MOTORS . . . for special applications are illustrated in Bulletin 59. Series universal, gearmotors, induction motors and motors built for military uses are described. *Lamb Electric Co.*, Kent, Ohio.

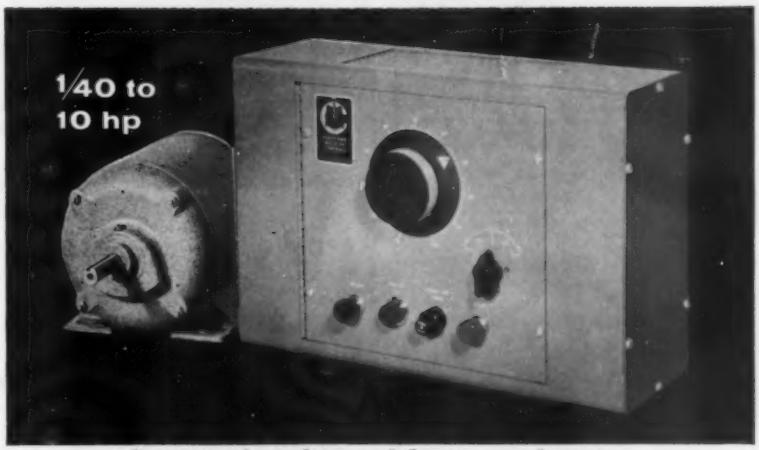
Circle No. 323 on Reader Service Card

SPEED REDUCERS . . . for NEMA "C" face mounted motors are described and illustrated in Bulletin 5-250. Reducer gear ratios from 4:1 to 90:1. *Janette Electric Mfg. Co.*, Morton Grove, Illinois.

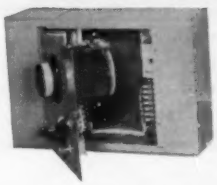
Circle No. 324 on Reader Service Card

REVERSING DRUM SWITCH . . . for control of single-speed electric motors up to 2 hp is described in 2-page bulletin GEA-7000. Switch can

Circle No. 45 on Reader Service Card



Electrical Adjustable Speed Drives



If you are looking for a compact, low-cost electrical drive and your application does not demand the precise speed regulation of an electronic unit, you may find exactly what you need in the CMC line of Electrical Adjustable Speed Drives . . . These skillfully engineered drives require only four wires to the dc motor and two for ac power . . . Complete with dripproof 1750 rpm dc motors. Gearhead, totally enclosed and other motor types available.

COMPACT CONTROL UNIT • MODULAR CONSTRUCTION • INFINITELY VARIABLE
REVERSING AND DYNAMIC BRAKING STANDARD • IMMEDIATE DELIVERY

We also offer a complete line of full-wave electronic drives featuring fine speed regulation, wide range of adjustment and unique construction.

CLEVELAND MACHINE CONTROLS, INC.
1155 BROOKPARK ROAD CLEVELAND 9, OHIO

DAIDO ROLLER CHAIN

COSTS LESS FOR GUARANTEED TOP PERFORMANCE

Precision manufactured to American Standard Specifications by Japan's largest and oldest chain manufacturer.

Large nationally known American companies are now using DAIDO CHAIN in their products with tremendous success while also reducing costs. Top-flight distributors, long known for selling high quality products are supplying and recommending DAIDO CHAIN *for performance plus savings.*

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Telephone: BEekman 3-6720

CHICAGO Office: 327 S. LaSalle St., Chicago 4, Ill.
Telephone: WAbash 2-8636

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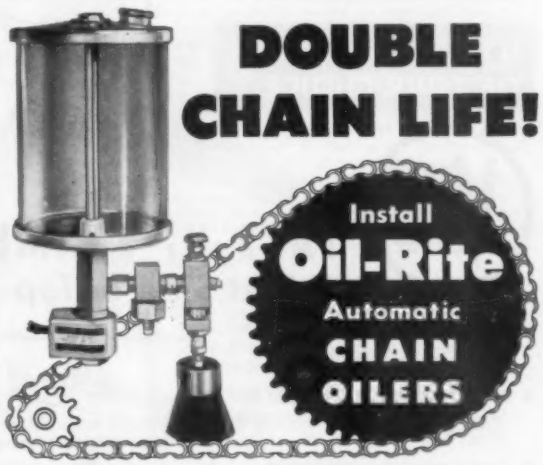
DOUBLE CHAIN LIFE!



Here's the *low-cost answer to chain breakdowns* caused by link-wear, stretch, corrosion and friction. OIL-RITE Chain Oilers feed oil by gravity through solenoid and sight feed valve to brush which rides the chain. Solenoid *starts and stops with driving motor*, making operation automatic, oiling only when chain moves. Drop feeding adjustable. 9 oz. — 1 gal. in capacity with brushes to suit your chains.

GIVE YOUR PLANT ALL THESE BENEFITS!

- Safe, sure chain lubrication
- Reduce chain wear
- Eliminate costly hand oiling
- Cleaner, less hazardous floors

Many styles of Electro and Manual Chain Oilers available. Write for Free Bulletin.

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Oil Cups • Dispensers • Oiling Systems • Valves • Oil Gages • Chain Oilers

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Circle No. 9 on Reader Service Card

STRENGTH WOUND INTO IT

Research has proved that a light flexible wire with several alternate layers of wire wound around it produces a cable more flexible than a single wire of the same diameter and is capable of carrying a much higher torque. Flexible shafts are composed of this type cable plus a flexible casing which provides protection from dirt.

There are two types of flexible cables used in flexible shaft assemblies. One is the power drive flexible cable in which the wires are wound in alternate direction. The outer layer of wire determines the direction of rotation and is made to tighten when in use to add strength and form a practically unbreakable unit. The main advantage of the power drive flexible cable is its simplicity of alignment, as it is capable of transmitting power over, under and around any obstacle.

Power drive cable with wires partly unwound to show construction.

Showing superimposed layers of wire wound in opposite direction.

The other type of flexible cable is the remote control flexible cable which due to being constructed of smaller gauged wires than the power drive cable, and wound by a special process, provides for both rotation and reciprocation such as the opening and closing of a valve.

Both of these flexible shafts may function in a continuous or intermittent operation with a minimum amount of vibration. They not only offer long lasting strength but also economies in cost, time and space.

Send for further details on how flexible shafting may be easily and economically incorporated into your design.

Write F. W. Stewart Corporation, 4313 Ravenswood Avenue, Chicago 13, Illinois.

LITERATURE *continued*

be changed from maintained to spring returned contact. *General Electric Co.*, Schenectady, N. Y.

Circle No. 325 on Reader Service Card

BRONZE . . . its uses and how it's made at Johnson's plants are described in an 8-page facilities brochure. *Johnson Bronze Co.*, New Castle, Pa.

Circle No. 326 on Reader Service Card

BEARING UNITS . . . of all types are described in 20-page catalog BU-103-A. In addition to load ratings and comparison charts, catalog includes specifications on flange and pillow blocks of various sizes. *Browning Mfg. Co.*, Maysville, Ky.

Circle No. 327 on Reader Service Card

MECHANICAL BREADBOARD . . . components are described in booklet #4. It also offers hints for instrument designers. *PIC Design Corp.*, East Rockaway, N. Y.

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NEWS

continued from page 10

Denison Engineering forms new sales region

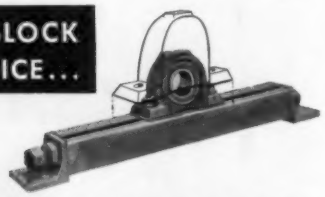
COLUMBUS, OHIO—Denison Engineering Div., American Brake Shoe Co., has formed a new North Central sales region for sales and distribution of its pumps, motors, and controls from its Cleveland office. The region covers Ohio and parts of Michigan, Pennsylvania, West Virginia, and Kentucky. Regional manager of the new region is D. J. Arnold, formerly district manager of the Detroit office.

Offer optional Corvair engine

DETROIT, MICH.—Chevrolet has developed an optional engine with added performance features, a new 4-speed transmission, and a heavy-duty chassis package for its rear-engined Corvair.

Principal modifications are a special camshaft for greater valve lift and opening duration, larger muffler passages, and a larger tailpipe. The

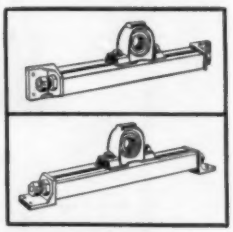
USE PILLOW BLOCK OF YOUR CHOICE...



Versa MOUNT

TAKE-UP FRAME
Mount Side or Top

- Use with any standard pillow block. One basic frame size for all makes and types—ball, roller or babbited.
- Mounts either side or top. Simply loosen locknut and turn mounting flange to desired position.
- Easily installed on old or new equipment.
- Delivery from stock in sizes for ½" to 2⅞" pillow blocks, travel lengths from 2" to 36".
- Mounting screw is totally enclosed for protection against dirt, contamination, etc., yet readily accessible when lubrication or cleaning is desired.
- All parts can be quickly disassembled without special tools and *are individually replaceable.*



Request Bulletin V-647 and Prices.

LOVEJOY FLEXIBLE COUPLING CO.
4852 W. LAKE STREET • CHICAGO 44, ILLINOIS

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New! BEAD CHAIN DRIVES

Low-Speed, Positive Drives or Motion Transfer
. . . At Far Less Cost!

NOW—BEAD CHAIN—QUALIFIED FOR DRIVES

Swivel-like Bead Chain and special non-slip sprockets make any drive possible . . . at low cost . . . eliminates expensive gears, universal joints, etc. Perfect for inaccessible locations!

PULL CHAINS
RETAINER CHAINS
Kinkless
BEAD CHAIN
Chain of a thousand uses! Low cost, attractive, easy to use! 5 Sizes: 3/32" to 3/8". Strengths 20 to 200 lbs.
Write for FREE Catalog!
SUSPENSION CHAINS
DOOR CHECK
TAG CHAINS

THE BEAD CHAIN MFG. CO.
209 Mountain Grove St., Bridgeport, Conn.

Circle No. 7 on Reader Service Card

transmission features synchromesh engagement in second, third, and fourth gears. The heavy-duty chassis developments include stiffer springs and shock absorbers, rear suspension rebound straps, front suspension stabilizer bar, and sintered iron metallic brake facings.

The new power plant is rated at 95 hp, compared to 80 hp for the standard Corvair engine.

Space-age design theme of conference

NEW YORK, N. Y.—How space-age design theory and techniques are applied to everyday commercial products for home and factory will be discussed at the four-day Design Engineering Conference to be held concurrently with the Design Engineering Show on May 23-26 at the New York Coliseum.

ASME's machine design division is sponsor of the conference. The show, to occupy all four floors of the Coliseum, will have more than 400 exhibits, with some 4000 experts on hand to answer visitors' questions. Attendance at the show and conference is expected to top 20,000.

New GE operation for component sales

SCHENECTADY, N. Y.—General Electric Co. has set up a components sales operation in Fort Wayne, Ind., to serve manufacturers in the home, farm, commercial, and light industrial markets. The operation will sell and service most of the products manufactured by the Component Products Div., as well as component-type products of other divisions.

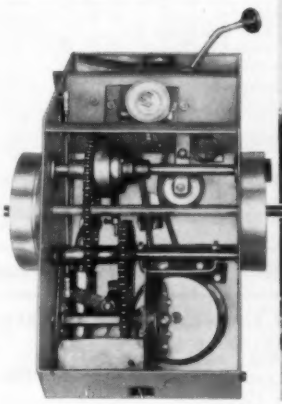
Manager of the new operation is Arthur W. Bartling, formerly manager of specialty sales in GE's Apparatus Sales Div.

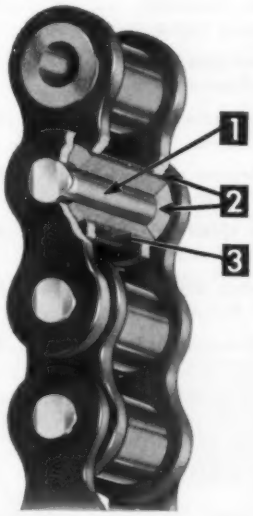
Warner names rep

BELOIT, WIS.—Jack B. Henderson has been appointed sales representative in the Cincinnati district for the Warner Electric Brake & Clutch Co. Formerly an industrial application engineer in Warner's home office, Henderson will be responsible for sales and service of industrial products in Kentucky, southern Ohio, and southern Indiana. His headquarters will be at 2637 Erie Ave., Cincinnati.

WHITNEY MSL* CHAIN solves Another Drive Problem!...

on the Ariens Imperial RIDING MOWER





Thousands of owners know the quality engineering of the Imperial Riding Mower manufactured by the Ariens Co., Brillion, Wis., which is backed by over thirty years of engineering and manufacturing experience in rotary tillage equipment. When Ariens engineers originally developed the Imperial, they specified a drive chain that would stand up to abrasive dust and repeated shock loads. They selected Whitney MSL Chain . . . the lubricated-for-life chain that outlasts conventional chain as much as 3 to 1 . . . to assure customer satisfaction.

If you need the *best* chain drive, switching to MSL Chain is no problem, as all essential dimensions conform fully to ASA Standards, making Whitney MSL Chain completely interchangeable with any similar pitch chain.

By developing a chain that incorporates oil-impregnated, sintered steel bushings which give up oil under pressure and heat to lubricate every working part of the chain, Whitney has solved a basic problem: *more damage is caused by faulty chain lubrication than by years of normal service.*

In addition to providing built-in lubrication, inherent characteristics and configuration of Whitney Sintered Steel Bushings provide greater contact area between bushing and links, which permits high interference fit to pre-load links for maximum fatigue resistance.

Why not investigate the many advantages Whitney MSL Chain can bring to your chain drives? MSL Chain is carried in stock by Distributors in all parts of the country for prompt delivery. Write for MSL Chain Catalog.

*Maximum Service Life

WHERE AND HOW BUILT-IN LUBRICATION WORKS

1. Protective oil film lubricates live bearing area between pin and bushing, minimizes wear by reducing metal-to-metal contact.
2. Oil impregnated bushings extend beyond surface of inside plates to: act as lubricated thrust bearings, control clearance, and provide an oil cushion between plates, eliminating plate galling and seizing frequently caused by mis-alignment of sprockets.
3. Oil film on exterior surface of bushings provides constant lubrication between sprocket teeth and chain. No rollers are required, as the tough oil film on bushing surface provides smooth sprocket engagement, cushions impact, and reduces drive wear. When drive stops, bushings re-absorb oil, insuring a permanent oil supply for life of the chain.

THE WHITNEY CHAIN COMPANY

a subsidiary of FOOTE BROS. GEAR AND MACHINE CORPORATION

4575 S. Western Blvd., Chicago 9, Illinois

POWER TRANSMISSION DRIVES

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The Original and Exclusive "Concentric" Shaft-King

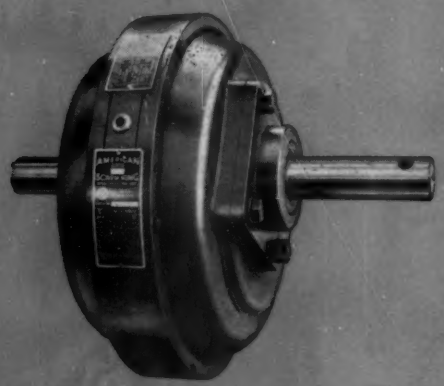
The first shaft-mounted reducer on the market . . . proved on over 150,000 installations. Exclusive concentric design permits foolproof torque-arm overload release. Taper-bushed hub makes mounting easy.

The New "Offset" Shaft-King

Same basic design, engineering and quality that has been proven in the original concentric American Shaft-King, but with input and output hubs offset, permitting easy belt take-up. Taper-bushed hub.

Compact, Easy-to-install Screw-King

The same time-proven design but with extended output hub and dual purpose dust seal. Bolts directly on trough end of screw conveyor eliminating wobble.



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